POPULAR AVIATION

Including SOUTHERN AVIATION and AERONAUTICS

A MAGAZINE FOR THE PROMOTION OF AMATEUR AVIATION AND PRIVATE FLYING

Volume XVII SEPTEMBER, 1935 Number 3

NRA CODE

TABLE OF CONTENTS

FEATURE ARTICLES

An Airy Chat With the Editor 142
Devastating Poison Gas—the Army Plane's Ally 144
Licking Airline Accidents 147
More About Brown's Duplex Prop 149
High-Lights and Side-Lights 151
Airline Operation in Sweden 153
The Marvelous History of the Pan American 155
Unshackling Flying Aptitude 157
Developing Ideas at Wright Field 161
Air Raids on Mosquitoes 163
The Mirror of the Sky—Reflects Planes' Position 164
The Eyes of the U. S. Army 167
Bailing 'em Out of Transports 169
P. A.'s Aviation Directory 171
Gasoline Models at St. Louis 175
A Fairchild Amphibian Model 177

PICK OF THE BRIEFS

Martin Flying Fortress Bomber 150
Something Different in Aircraft 152
Look Out Automatically Warns Planes 152
The Activities of Our Aero Clubs 156
A Low Aspect-Ratio Plane (Arup 104) 158
We Thought So 159
Caproni "114" Advanced Trainer 159
A New English Avro Sportplane 159
The Fairchild High-Speed Amphibian 160
The Morane-Saulnier Record Holder 160
Quentin Roosevelt 160
Two Men in a Plane Shoot Snaps 162
Design Thefts to Stop 166
New Tunnel for Royal Aircraft Lab 166
The Caterpillar Does Its Bit 166
Floating Around in Akron's Breezes 168
Caproni Celebrates Birthday 168
The Aero-Sportswoman 170
Potez Airliners for the Air France 172
DeHavilland Four-Engine Airliner 172
A Swell Little Canadian Plane 173
Testing Converted Plymouth Motors 173
Device for Air Racing 173
Aubier-Dunne Lightplane Engine 174
Frakes to Start Aviation School 174
Diagnosing Motor Troubles 174

Copyright, 1935
Aeronautical Publications, Inc.

POPULAR AVIATION, Volume 17. Number 3. September, 1935. Published monthly by Aeronautical Publications, Inc., at 608 South Dearborn Street, Chicago, U. S. A. William B. Ziff, Publisher; B. G. Davis, Editor; John B. Rathbun, Managing Editor. New York Office, 551 Fifth Avenue, New York City. Subscription $2.50 per year, single copies, 25 cents; foreign postage, $1.00 per year extra. Contributors are especially advised to retain copy of their contributions, which must be accompanied by return postage. All such material will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Any copy accepted is subject to revision or changes to meet the requirements of this publication. Payment for copy used will be made at our current rates. Photos and drawings will be considered as constituting a part of the manuscript in making payment unless otherwise specified. Entered as second class matter, January 24, 1933, at the Post Office, Chicago, Ill., under the act of March 3, 1879.

XUM

Devastating Poison Gases Are

by
WILLIAM GILMAN
Expert in poison gases and chemical warfare tactics

Poison gas drill by Italian troops during recent mock gas attack on Naples.

NEW YORK City during a future war will sprawl across the Hudson in gray quiet. It will be half invisible with only a few skyscraper peaks groping above a thick gray blanket. Nothing can be seen stirring for a fog has settled upon Manhattan. It is a fog of death.

You will not see a rain fog. The white clouds swirling down the canyon-like streets, seeping into the buildings, settling on the parks, will be titanium tetrachloride or some other screening smoke released by airplanes. It blinds the city.

With it has been mixed some lachrymator like chloropicrin. Or, perhaps, it followed the smoke by a few minutes. It sets the city to vomiting and, in their physical agony, the inhabitants, assuming they were equipped with gas masks, have been unable to don them. Hard upon these chemicals has come an asphyxiator like phosgene. Those who are not dead already are probably now coughing their lives away.

Strategy of modern chemical warfare from the air calls for just such procedure: First, a smoke screen to demoralize the enemy and cripple their defense; then a so-called "strategic" gas to make them cry, sneeze, itch or vomit so that they lose mental control and throw their masks away and finally a killer gas to deliver the *coup de grace* when they are suffering and without masks.

We are speaking of "poison gases" primarily as they are called in popular language although most of them, strictly speaking, are not gases at all but liquids and solids. Two other weapons are usually mentioned in squabbles over the legitimacy of chemical warfare: flame throwers and bacteria, but of these the first has not been very effective so far and the second has yet to be tried.

Will great cities be laid desolate by chemicals in the next war on the theory that there is no "non-combatant," that everybody helping fight a war is an enemy? Or on another theory that the quickest, hence most humane, way to bring the rival to terms is by spreading panic behind him? The question is an interesting and grim one and only a next war can give the answer because this question depends on how practical chemical warfare can be.

If cities are not laid desolate it will not be because the Powers consider poison gas inhumane but because it is impractical. And the question of its practicality can be answered only when this problem is settled—can a nation's air force defend it against the enemy's bombing squadrons? If the bombers can get through they'll gas the non-combatants—little doubt of that.

Gas warfare depends upon its older brother, aviation—although only a few years older at that. These two powerful and youthful methods of warfare—chemical and aeronautical—are closely allied. And just as the discovery of each new chemical has spurred engineers on to finding a mask and canister that will stop it, so has the development of each faster wilier bombing plane brought out a more efficient defending ship to harass it.

As far back as the Hague Conference of 1899, various nations tried to outlaw chemical warfare. All of the nations signed except the United States, whose delegate said there was no justifiable reason for outlawing as inhumane something that had never been tried. Well, it was tried 16 years later.

Some say the French used Chlorine first. Most place blame upon the Germans. It was the Hun attack at Ypres on April 15, 1915, that opened the world's eyes to a new epoch in warfare. Then began a race for the draw with this new weapon. New gases tumbled over each other coming out of feverish laboratories. And it was not long before the air bomber was called in to collaborate with the gas service.

The end of the war found the civilized world still horrified by gas warfare. The United States signed the Washington Disarmament Conference treaty of 1921. This treaty was tossed around for five years as one nation after another found fault with various clauses. When it came back to the

The Tokyo, Japan, Young Men's Patriotic Association demonstrating the use of gas absorbing powders for protection against poison gas during mock raid.

the Army Planes' Allies

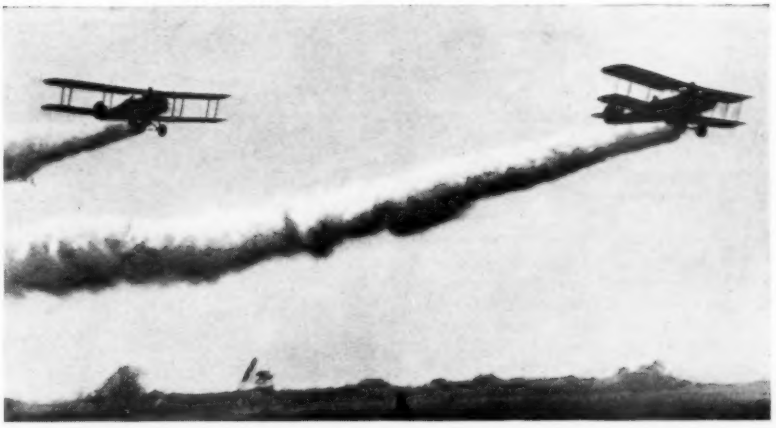
American Senate in 1926, as the Geneva Gas Protocol public sentiment had changed and it was not ratified.

Figures from the last war show that poison gases were more humane than other weapons in that they caused fewer deaths. They show that twenty-four percent of American soldiers died who were wounded by shrapnel, machine-gun slugs, etc. They show that only two percent of casualties caused by gassing proved fatal. But gases were in their infancy then. There is as little sense in comparing chemicals of today with those of 1917 as there is in comparing pursuit ships of today with wartime Jennies.

Also, those figures do not take into account the thousands of American doughboys who returned to cough away their lives at home as a result of gas-eaten lungs. Unquestionably, the humane argument will have as little influence in stopping the use of chemicals in the next war as would treaties. A nation, in war, fights with everything it has.

On the battlefield, gas attacks can be made from the ground. Sole reliance will not be placed in the air. The infantry will have grenades. The artillery will have various special guns, including Stokes mortars and Livens projectors. The days and methods of 1915 are over. The army will not open tanks of chlorine as did the Germans in the early days of the war, and pray for a favorable wind to carry the cloud of fuming gas over upon the enemy. The Stokes mortar shell can travel a half mile and more. The Livens projector will send its projectile five miles. But even these are puny distances.

For long-range raids the airplane will be called upon. It will carry shells of one kind or other. Those with green striped bands will contain perhaps a killer like phosgene. Those with blue bands will contain a strategic gas like chloracetophenone, to produce tears. Those with yellow bands will contain a smoke gas like titanium tetrachloride to spread fog through the enemy or hide the advancing attackers. Other ships will carry special tubes through which burning chemicals like Lewisite will be sprayed down.



Japanese army planes laying down a smoke screen before making gas attack in recent war maneuvers. Sixty planes took place in this drill at Yoyogi Field, Tokyo.

But for really crippling the nation at war back home the air force will be called. The navy will have its place, of course. Its chief duty will be concerned with troop transportation and blockading. In regard to bombarding of a coast line or coastal cities sea fleets will not be so effective. The various armadas are too well balanced today to allow that of an attacking nation to ravage with impunity.

Without doubt, the air force of an attacking nation will find justification for being, if for no other reason, in its ability to strike terror back of the lines. Likewise, the air fleet of the defender will also have a heroic job to perform in keeping the marauders away.

It's upon that question, we repeat, that much will hinge. Will the defending air force be able to keep the enemy's bombers off? A hurried raid with ordinary shells may not prove effective. But there is little need in accurate aiming with gas shells. Chief factor will be the direction of the wind. If it is in the right direction, it will do most of the work after the shell has burst.

The Zeppelin raids on London in the last war produced some havoc to buildings but their chief effect was upon the morale of Londoners. It is obvious to see what would have happened to this morale if the cruising Zeppelins had left the air poisoned behind them. It can then be stated, as a maxim, that the efficiency of a gas attack upon a city will depend wholly upon the success of the attendant air attack.

Returning to that picture of New York under a gas attack, we are faced first of all by the fact that the city has never in modern times been attacked in any fashion, much less by gas-hurling airplanes, so that we can but theorize. Enough chemicals, without doubt, would exterminate or drive off the panic-stricken population. The question is: how much would be necessary? In other words, could enough bombers of an attacking nation penetrate New York's defense?

Various authorities agree that, even if the city were not shelled out of existence, the effect of an air raid would have incalcuable effects upon the city's morale. They do not agree so readily upon the actual death and destruction that could be caused by an air fleet that would have to contend with a defending force.

One has pooh-poohed the dangers of a gas attack upon cities with skycrapers, declaring that in order to lay an effective chemical barrage, a plane must

Smoke (to simulate gas) creeping up behind the Italian troops during recent gas drills.

XUM

fly no higher than four hundred feet above the ground. Others, too, consider the existence of skyscrapers and their effect upon attackers. Dr. J. Mitchell Fain, in "The Chemist," ventured the opinion two years ago that the ventilator systems in tall buildings would be effective in carrying gases out of the structures. Pointing to the fact that New York City contains three hundred square miles, he estimated that the strongest air power at that time could only put down chemicals over one square mile, and this but to a depth of thirty feet above the ground.

But Dr. Fain, neglecting the fact that one square mile seems pretty small pickings for a modern air fleet's attack, was writing about wartime gases. He did not consider the fact that gases have been undergoing such rapid development that navy masks, by 1929, had undergone 33 changes of structure in order to make them worthy of coping with the latest chemistry.

Chlorine, much used in the war, will kill in thirty minutes if three ounces of the gas are contained in one thousand cubic feet of air, while Lewisite, born in the war but really developed since then, produces the same effect if but five-hundredths of an ounce are mixed with air in the same proportion. And only three ten-thousands of an ounce of chloracetophenone mixed with the above-stated volume of air is lachrymatory.

One only part of hydrogen cyanide in a million parts of air is a fatal dose. This gas, used in some Western states to effect capital punishment, was so dangerous indeed that chemists did not dare experiment with it in the last war but that is no proof that some method may not be discovered, or has not been found quietly, for using it in the next.

Major-General H. L. Gilchrist, chief of the Chemical Warfare Service of the U. S. Army has declared that he "knew of no gas which could be delivered in sufficient concentration to destroy the population of a city," pointing to the fact that bombers would be hindered from performing wholesale destruction by squadrons of defending planes. He also ventured the opinion that modern skyscrapers would be found gastight.

Members of the British Voluntary Aid Society, Chiselhurst, Kent, practicing gas drill. Caves, 90 feet deep and accommodating 30,000 people have been dug in this district, for protection against gas attacks.

Writing in a European magazine, the Swiss military engineer, Captain W. Volkart, left the field of generalizations and went into details.

He took the city of Zurich as an example, showing that an air raid could cause great damage and alarm to the community but maintaining such an attack could not "wipe out" the city. In that city, according to Captain Volkart, 250,000 persons live in an area of seventeen square miles of which six are densely populated. If defending planes could not hold off the attackers, he stated, 150 tons of mustard gas could raise havoc in the densely populated section. Something like 500 bombers would be necessary to do the job, he estimated, pointing out that not all of these ships would be effective. Some would be engaged with enemy pursuit ships, others with anti-aircraft guns.

In all these arguments, it seems, those discussing the problem consider only that dramatic business of "wiping out" a city. They do not take into consideration the general panic that an air raid would produce.

The Earl of Halsbury, discussing the subject, took all this into consideration plus a few other things. The next war's gases cannot be judged by those adolescent ones used in the last war, he stated. One part of diphenylchlorarsine in 200,000 parts of air causes casualties, he pointed out, and only one part in 50 million of air gives symptoms typical of that chemical. It produces mental distress, utter dejection and loss of mental control.

Aside from the terror caused by an air raid as such the chemical actually drives people mad. Not only that, but this toxic smoke, which produces sneezing in minute quantities, is usually followed in modern gas warfare strategy by a killer gas. It creates such physical discomfort and mental terror that victims will not don masks. Then they are ripe subjects for a really killing chemical.

He had learned, he stated, that three foreign firms could produce one hundred tons of diphenychlorarsine, nicknamed D. A., weekly. This is the strategic gas. But by juggling a few molecules, the gas can be transformed easily into dichlorcyanarsine. That "cyan-" section makes it a killer. Thus, shells of the first could be followed by those containing the second, or else they could be mixed in the same shell. London proper, that portion excluding the suburbs and outlying districts, could be filled to a depth of forty feet with a lethal mixture of the arsenic gases and only forty tons would be required. That

(*Continued on page* 194)

The Sanitary Detachment, Paris, France, administering "aid" to a posed "victim" of a gas attack in recent war maneuvers.

Licking Airline Accidents

by E. STANTON BROWN

Here, the author answers authoritatively, the often asked question, "Isn't it dangerous to ride on the airlines?" He says "no" and has the figures to back his statements.

HI THERE! Do you know that accidents happen to airplanes? Oh, you do? Well, guess you couldn't help but know, what with newspaper headlines being printed in the same size as always. At that, it might be a good thing that they are. Makes the operators, whose gas and oil money depends on those who read the newspapers using their airlines, more careful than ever. But accidents still do happen occasionally and they scare said operators into a frenzy.

What's that? The newspapers exaggerate the importance of the few accidents that do happen! Air Travel is safer every year! You're safer in the air than in your own home; ask an insurance company! Automobiles kill every year in the United States a total number of people equal to all U. S. casualties during the World War! Scheduled passenger planes flew 4,878,655 miles per fatal accidents and flew 10,727,026 passenger-miles per passenger fatality in 1934!

One out of every 126 people in the U. S. is either killed or injured in an automobile accident every year while only one of every 27,158.82 air line passengers was killed and only one out of every 10,494.09 received an injury, slight or otherwise, in 1934, and that was a bad year! Accidents also happen to railroads, steamships, elevators, street cars, bicycles, baby carriages and scooters!

Miss Ruth Flekke, a stewardess on the United Air Lines, with thermos bottle and everything, ready for a long ride on a scheduled run. She has many thousands of miles to her credit.

WHOA! I'll say *uncle*. I'll even agree with you. You're right, you faithful readers and statistical maniacs, you mighty upholders of aviation. May God bless you and Santa Claus put candy and subscriptions to POPULAR AVIATION in your stockings next Christmas. I'm grateful to you, and so is the whole aeronautical world, for your immediate and staunch defense. But I'll bet two bits to a plugged nickel that few of you ever seriously sat down and mulled over in your brains just how important this question of safety is; how it is the background of the entire industry and how almost every engineering advance of great importance has been, and is still, directed toward safer aviation; how the application of the airplane to transportation can advance only proportionately to the increase in safe and reliable operation and how directly it is linked up with public acceptance of air travel.

Too much, much too much, of the early history of the airplane and of air transportation has been burned deep into the minds of people with blood and flame, sudden and violent death. While we have emerged from the period of constant catastrophe, the occasional accident on the air lines brings the old bogey of fear out in front of those who travel.

We have to lick the accidents and I think you'll agree with me that an investigation of their "whys" and "hows" and what is being done to make air travel safer, will prove mighty interesting. There is no reason on earth why the airplane should not develop into one of the safest means of transportation.

It was only ten years ago that E. Hamilton Lee, and a hundred or so more like him, would take a last squint at the weather info, buckle a 'chute to their rear ends, climb into a D.H. and give her the gun. A compass, clock, altimeter, bank-and-turn indicator and a string of lights across the country would lead them on their way. If weather hid the lights, they stuck to the compass and prayed. If the ceiling closed down suddenly at their destination, they didn't find out about it until they got there, then it was a case of feel the way down, look around for a clear spot to get down through before the gas gave out or cut the switches and bail out.

If hardy passengers, like Will Rogers, wanted to fly, they got a 'chute and a seat on the mail sacks. Even when the Boeing 40-A and 40-B came along a couple of years later, with their tiny cabins for a couple of passengers, the doughty ones would snap on the 'chutes and wonder how they were going to get out if they had to.

We have come a long way in these past few years. The 'chute in air transportation is a relic of the past. Each airplane is in reality two airplanes. Every instrument is duplicated in some way so that if one goes on the Fritz, there is another to do the job. Blind flying is taken as a matter of course and never bothers anyone. If one motor goes out, the other will keep the ship up to about 9,000 feet and carry the entire load. The beacons are supplemented by radio beams; intermediate landing fields slide underneath the wing about every thirty miles. Weather reports come flashing in every thirty minutes and the pilot always knows what is ahead of him. With the regularity of clockwork, the transports complete their schedules, approximately 95 percent. efficient throughout the year.

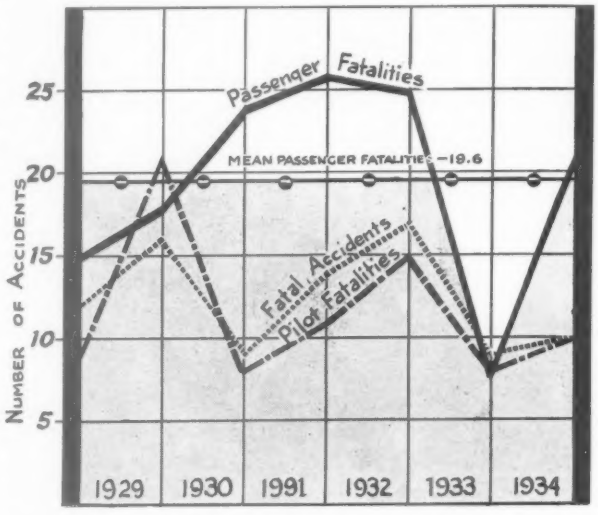
But still we have accidents. The weather isn't licked yet, in spite of all that has been done. Machines and their engines have yet to reach perfection. The human element has yet to be considered. We've a long way to go.

Taking the statistics for the last three

years, it is gratifying to note that the total number of accidents in scheduled air transportation is definitely on the downward trend, being lowered from 115 in 1932 to 73 in 1934. It is likewise gratifying to note that accidents due to powerplant and structural failures are noticeably decreasing; that the weather is definitely getting a basting as an accident cause.

There is one item, though, that is rather disturbing. While the mechanical efficiency of our equipment is increasing, it seems that the percentage of accidents due to pilots and other personnel is showing a dangerous increase. Within the last three years the percentage of scheduled air line accidents due to pilot errors has jumped from 11.93% in 1932 to 25.48% in 1934. In other words, one quarter of the accidents on the lines have been caused by pilots' errors in judgment, poor technique, carelessness or negligence.

Whether or not the figures are absolutely correct might be open to argument, but they are on file at the Department of Commerce. Then, again, it is always mighty easy to shove off on the pilot the responsibility for an accident, though with the new investigations being made by the Department of Commerce, and their findings being made public, it will be increasingly hard to do so without ample justification. All in all, the pilot has a difficult job and responsibility that few men would like to assume; an airplane costing from $65,000 to $87,500, valuable mail and express, the lives of up to fifteen passengers and the reputation of his company.



Graph showing the variation of accidents on airlines by years. Passenger fatalities indicated by heavy line.

As an example of how the new Accident Board works, the findings in regard to the Douglas that TWA lost near Kirksville, Mo., on May 6, 1935, with the loss of five lives, are illuminating as to the probable causes. The investigation showed that the probable contributory causes were:

(a) A forecast by the United States Weather Bureau which did not predict the hazardous weather that developed during the latter part of the forecast period.

(b) Improper clearance of the airplane from Albuquerque by the company's ground personnel because of their knowledge that the plane's two-way radio was not functioning on the western night frequency.

(c) Improper control by the company's ground personnel at Albuquerque for not calling the airplane back or ordering it to stop at an intermediate point when it was found that two-way radio communication could not be established.

(d) Error on the part of the pilot for proceeding in flight after discovering that he was unable to effectively communicate with the ground.

(d) Failure of the company's ground personnel at Kansas City to expeditiously dispatch the airplane to a field where better weather existed, when it became apparent that the ceiling at Kansas City was dropping to and below the authorized minimum for landing and while the airplane still had sufficient fuel to meet the Department of Commerce requirement of 45-minute fuel reserve after effecting a landing.

Of the five scores, four were controlled entirely by the human element, and failure of the personnel can be assumed to be the direct cause of the accident. The only mechanical failure was that of the radio, which if handled properly by the personnel, together with proper judgment of action in the existing conditions, would have saved an expensive airplane, five lives and a black mark against the reputation of the company.

The U. S. Weather Bureau was also at fault, but often changes in weather come about so swiftly, as in this case, at the end of the period of forecast, that there is a loop hole there through which the Bureau might escape a goodly portion of its share of the blame. Without doubt, the ship should have been grounded at Wichita, Kansas, and not allowed to continue on into conditions growing steadily worse.

It is to be regretted that the new Radio Blind Landing System, which is being installed throughout the country by the Department of Commerce, was not then available at Kansas City. With this system, a pilot can bring his ship safely to earth even if he can't see more than two feet in front of him.

There are twelve cities at which the system will be first installed: Newark, N. J.; Pittsburgh, Pa.; Columbus and Cleveland, Ohio; Indianapolis, Ind.; Chicago, Ill.; St. Louis and Kansas City, Mo.; Los Angeles and Oakland, Calif.; Seattle, Wash.; and Washington, D. C. The Department is working from East to West in the installation, and shortly, planes will be sliding into fog-bound Newark as a matter of routine.

The Bureau of Air Commerce describes the blind landing equipment as follows:

"The elements of the Army Air Corps radio blind-landing system on the airplane are a radio compass, a radio receiver which flashes a light when actuated by the signal of a radio marker beacon on the ground, a sensitive altimeter and a directional gyro, together with the usual flight instruments, such as air speed indicator, turn and bank indicator, rate of climb indicator, and artificial horizon. The radio compass is used both in navigating to the marker beacon and in approachig the landing area.

"On the ground are two radio stations transmitting on different frequencies. One is located about 1500 feet from the airport and the other about two miles away. Also, at each radio station there is a secondary transmitter to flash on the light in the airplane's cockpit whenever the craft passes over the transmitter.

"The pilot approaches the field using his radio compass, tuned to one of the stations, then establishes his course on a line between the two radio stations, flying back and forth over them as many times as is necessary to set the course on his directional gyro. On the final approach to the field, using the sensitive altimeter, he descends to 800 feet over the station two miles away, glides on down to about 150 feet over the station near the airport boundary, and then completes the landing maneuver with the aid of his flight instruments and the lights on the ground, when they are visible."

The full meaning of the system is increased safety beyond measure and permitting the airlines to fly schedules which heretofore would have to be cancelled. It means that more people will fly during the winter months, when visibility is at its worst, and that the sharp decrease in passengers and in completed schedules, during the winter, will lessen materially.

The bogey of ice is gradually being licked, too. United Air Lines, during the past winter, fully developed deicing apparatus, and was thus able to fly weather which kept other lines' planes on the ground. The equipment is available to everyone, however, and next winter should see every line in the country so equipped. Increased efficiency in weather forecasting is also

(*Concluded on page* 190)

More About Brown's Duplex Prop

SO MANY inquiries have been received concerning the unique Brown propeller system that appeared in a recent issue, that more information is given here on the subject.

In this system of propeller drive, two propellers revolve in opposite directions, thus neutralizing the engine torque and improving the stability of the plane.

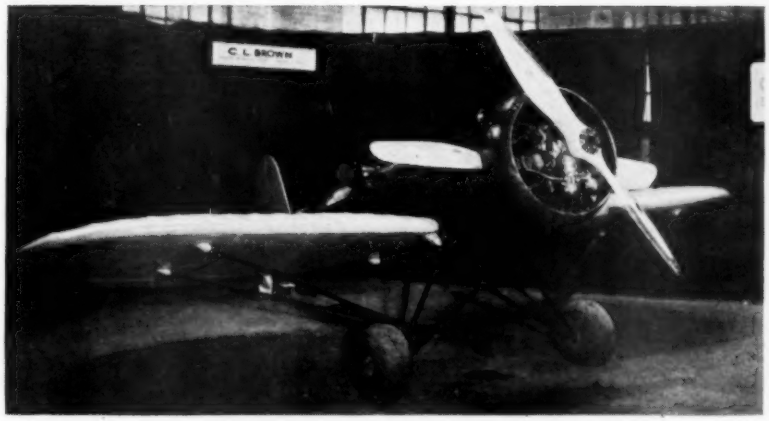


Fig. 1. The Brown monoplane on exhibition at the Kansas City Auto show.

WORKING on the theory that reverse torque or motor reaction, of an airplane could be utilized for additional power, C. L. Brown, of Rushville, Missouri, an oil jobber, sent his first papers to the patent office, in the spring of 1929.

This development involved the use of a second propeller with opposite pitch directly behind the regular front propeller. The rear prop utilizes the force against the cylinder head of the motor, while the front propeller is connected with the crankshaft in the usual manner.

Not only did Mr. Brown consider that an engine with this arrangement would produce more available propeller thrust, per pound of motor weight, but also that by the elimination of torque, stability would be increased to a marked degree, thereby making a steep climb safe from spinning.

Fig. 4, shows Brown beside his first ship, a Heath, built during the winter of 1929 and 1930. Originally, it was equipped with a Heath B4 motor. In the summer of 1931, Brown decided to test out his theory, so replaced the Heath with a twin cylinder Cleone as shown in Fig. 4. The Cleone was converted into a rotary motor and the housing was attached to the rear propeller. The front propeller was mounted on the crankshaft in the usual manner.

Being a high speed motor, the Cleone did not function very well with this arrangement. However, it gave the builder a chance to prove his theory and, with a few minor repairs, is still capable of flight.

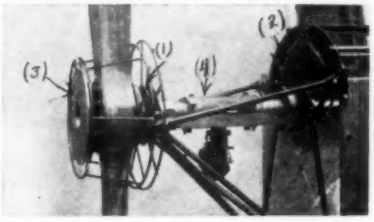


Fig. 2. Details of suspension.

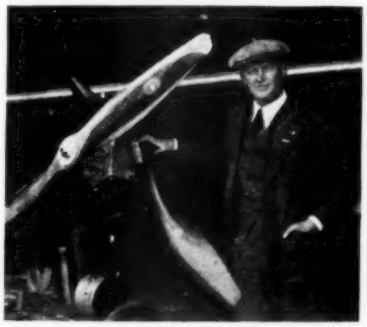


Fig. 4. Mr. Brown with the first arrangement.

Brown's latest craft, an open type monoplane, shown in Fig. 1, was exhibited at the recent Kansas City Auto Show. Originally fitted with high wings, this ship was built in 1932 and flown for two years in its experimental stage. Constructed under the builder's own specifications, the fuselage, tail-assembly and landing-gear are all of welded steel tubing.

It is powered with a Genet 80 h.p. engine, weighs 1,050 pounds, and has an overall length of eighteen feet. The wing span is 18'-2". Both wings are set at the same angle and the ship will turn right or left without touching the stick. The dihedral angle is three degrees.

This plane cruises at 120 m.p.h., has a top speed of 140 m.p.h., and lands at about forty miles per hour. It will climb at a thirty degree angle without any tendency toward falling off on either wing.

The take-off speed is no greater than the landing-speed, due to the fact that this plane can be stalled without any tendency of rolling over or turning around. Also, with this depth of wing chord, the tail may be held down farther, causing the propeller thrust to aid the wing. The plane sets down easily, so that the air-wheels shown are the only cushion necessary when landing.

The five-cylinder Genet motor was converted from a radial type to the rotary principle. First, the carbureter was machined off flat with the rear of the motor. Then the scavenger oil pump was moved two inches off center, so that it could drain the motor to a better advantage. A lead weight was placed opposite the pump to balance the motor. An outside oil line was also installed so that the oil could find an outlet from between the cylinders. This

Fig. 3. Rear view showing the duplex propellers and the short stubby wings used for demonstrating absence of torque.

XUM

line was connected to the scavenger pump, also. Absolutely no change was made in the front propeller arrangement nor was the crankshaft altered in any way.

In Fig. 2, the method of mounting the motor is illustrated. At (1) and (2), ball-bearings support the hollow engine shaft upon which the rear propeller is mounted. The brake drum shown next to the rear bearing (2), holds the motor in a stationary position while cranking. Plate (3), is secured to the rear propeller and shaft on one side and bolts to the motor housing on the other.

The carbureter (4), is stationary with the intake leading to the motor through the hollow shaft. The sleeve attached to the carbureter at (4), contains packing at each end between it and the shaft. Twelve five-eighth inch holes are drilled through the shaft for the gas entry.

Just at the rear of this sleeve the shaft is sealed. Through this partition are two small tubes, supplying the oil intake and outlet for the crankcase. At the rear of the hollow shaft, a sleeve similar to that at the carbureter intake, contains oil lines leading to and from a stationary tank.

There is also a small shaft running through the large one, which is attached to the crankshaft. This extends at the rear of the tube for the purpose of driving a tachometer. A tachometer for determining the speed of the rear blade is geared to the hollow shaft.

In developing this principle, two planes have been built; three sets of wings and six propellers have been used. The first set of propellers had a pitch of four and one-half feet for the front one, and eight feet on the rear blade. This combination allowed the motor to run too fast.

On the second set, the pitch was; front, 6′-6″; rear, 12′-0″. By using a motor that was not built to rotate, the centrifugal force caused by this ratio interfered with the valve action, causing a loss of several horsepower. However, a standard rotary motor would not be affected by this action.

The front blades of the present set are seven feet diameter with a pitch of 5′-4″. The rear propeller is two inches longer and has a pitch of 15′-0″. Nichols-Beazley, built the front propeller and timed it at 1,800 r.p.m. on a Genet motor similar to the one on this plane. However, when it was placed on this revolving Genet, it turned 2,150 r.p.m. The only way this could be accounted for was that the suction of the rear propeller decreased the resistance of the front one.

Using the present type wings, it would be impossible to fly this ship with the motor mounted in a rigid position. The torque would be far greater than the wing surface could withstand.

In still air, this plane takes off in from two hundred to three hundred

(Concluded on page 188)

Martin Army Bomber "Flying Fortress"

The converted Martin bomber resting on the ramp turntable ready for launching.

THE U S. Army Air Corps has just put a Martin Bomber on pontoons. This plane was originally built as a landplane and a squadron of them successfully made a mass flight to Alaska and back last year.

It carries 5 machine guns and a cargo of bombs, and is the fastest bomber in the world, capable of 200 m.p.h. It is faster than many attack and pursuit planes. This plane was pontooned to test out its efficiency in water, and was completely successful.

Combined with this experiment the plane was tested out on the new seaplane ramp of the City of N. Y., at the East River and E. 31st St. The plane flew over the river, landed and taxied up to the ramp. It came to rest on the end of the ramp when, by mechanical means, water was ejected from the tanks under the ramp and the ramp with plane on it lifted above water.

Then, the turntable on which the plane rested turned around and brought the plane facing the rest of the ramp. A short while after the plane was "wheeled" down to the turntable, which turned the plane around facing the river. Water was let into the tanks until the plane finally floated in the river, when it taxied away and took off. The entire operation took only a few minutes.

This demonstrated the efficiency of this "Flying Fortress," as a landplane and to act as an over-water weapon, to protect coastal cities like N. Y. in time of war.

It would be interesting to know just how a seaplane bomber of this type takes off with its load of bombs and how it will act as a gun-platform in turbulent air. On a glass smooth surface, take-offs with full load might be somewhat difficult while, from the other standpoint, seaplanes have never been noted for steadiness to the degree that steadiness is required for bombing operations.

This is a most interesting experiment that, if successful, might easily revolutonize coastal defense. An attack against enemy battle ships and cruisers, by squadrons of these bombers would most certainly break the back of the offensive. The enemy defense would be limited to a few pursuit planes at least, and with the great speed of these bombers, the pursuit planes would not be particularly effective.

For offensive operations against enemy seaports, it is just a question of getting sufficiently large aircraft carriers to take care of the immensely greater size of the bombers, and appliances for handling the greater weight of these ships. To use such planes for distant offensives, however, is not an impossibility. It is more a problem of magnitude than a revision in the equipment design.

Front view of the Martin bomber converted as a seaplane. The structural work is very clean.

High-Lights and Side-Lights

by M. A. RODDY

Pertinent and timely remarks upon aviation personages and doings in the aviation industry. The clearing house of aviation news in brief.

WASHINGTON WHISPERS: Back in barefoot days in Jersey I always thought that whitewash was used exclusively to paint chicken coops but now it appears to be the color of the ink used by Messrs. Roper's and Vidal's Air Bureau of Commerce and various parties determining causes of fatal air crashes.

$10,000 has been appropriated for a special Senate committee to investigate the T.W.A. crash which cost the life of Senator Bronson Cutting of New Mexico, and according to Colonel Harold Evans Hartney, technical advisor, the committee plans to summon Colonel Charles A. Lindbergh, Major Jimmy Doolittle and Captain Eddie Rickenbacker to testify as an aid to the preparation of a new aviation code to make the United States the safest commercial air service in the world. All of which is very well but it should be remembered that you don't fly airliners on paper and a good way to find out what is best for schedule flying would be to summon some of the pilots who actually fly airliners carrying passengers and mail. They should have a pretty good idea of what caused the death of an airline pilot every 29 days for the past five and one-half years. . . . The air mail bill designed to create permanent legislation has passed the Senate and there remains only a joint conference before it becomes a law. . . . Airline pilots may also shortly come under the protective provisions of the Railway Labor Act which is being amended to include air transportation.

* * *

SOME time ago I told you that things were pretty hot in the Air Bureau of Commerce. Added to the folks who have discovered that, is former Assistant Secretary of Commerce, Ewing Y. Mitchell, who has been removed from office and replaced by John Monroe Johnson of South Carolina. Mr. Mitchell charged that the T. W. A. crash would not have occurred "had a person with more experience, knowledge and stability" been chief of the Bureau of Air Commerce, a statement which caused Secretary of Commerce Roper to appear before the Senate in defense of Mr. Vidal. . . . Around the Capital they are saying, "Brother, you ain't heard nothing yet." . . . Oh, Mr. Jolson!

* * *

ALL of Europe is busy conducting secret tests of mystery planes with Great Britain apparently in the lead. One of the new ships known as the "Queen Bee Robot" may be used in anti-aircraft gunnery practice with no one in it, while another model carries five guns, the heaviest armed plane in the world.

* * *

WITH the completion of a record return trip from Alameda, Calif., to Midway Island, Pan American Airways has made further progress in the establishment of its trans-Pacific commercial air line. Plans are also under-

The Queen Bee robot ship flying without a pilot under radio control. The two officers are controlling its flight by means of the radio transmitter in the right foreground.

way for the establishment of a France to America air line by way of the Azores and Bermuda. Albert Plesman, managing director of the Royal Dutch Airlines, predicts air line connections between the Netherlands, Indies and the United States.

Ratification by the Bolivian government of a contract with Pan American Grace Airways for regular service from Tacna, Peru to La Paz, left Paraguay the only country in South America not possessing Panagra service. The contract was also for the highest service in the world as La Paz is situated at an altitude of 12,200 feet in the heart of the Andes.

* * *

THE Senate Military Committee has approved the House bill authorizing the War Department to create frontier air defense bases which will cost them, exclusive of land, $110,000,000. . . . The House has also approved a conference report which would provide 555 new airplanes for the Navy.

* * *

WHEN Alfred and George Monteverde, brother flyers from Portugal, escaped in their recent spectacular crackup on their take-off from Floyd Bennett Field for Rome, they did not have to use their poison vials as they fortunately escaped injury. Their plane had been named in honor of the late Francesco de Pinedo who met death less than two years ago in the same take off for the New York to Rome flight that has never been successfully completed and which has already cost 13 lives.

* * *

THE National Air Races will be held at Cleveland beginning August 30 to September 2 and the Thompson Trophy Race will be over a 150-mile course this year instead of the previous 100-mile and will carry prize money increased to $15,000. In the Bendix Trophy Race, $12,500 will await the winners of the cross-country grind and there is a possibility that for the first time a woman will participate in the event as Maxine Howard, wife of Benny Howard, noted air mail pilot and builder of racing planes, may fly her husband's "Mr. Mulligan" with which she has already set some record marks.

* * *

ALTHOUGH Mr. Ickes doesn't seem inclined to furnish funds as yet, the Illinois Senate passed a bill already approved by the House which would provide Chicago with a lake front airport. In Washington, there seems to be a faint hope that the 10-year squabble over where the municipal airport should be located will soon be settled should the Gibson bill which is now in the Senate be passed. The measure provides $2,500,000 for building Gravelly Point within five years.

Promise is also made for the improving of Washington Airport while Gravelly Point is being built, closing Military Road and combining Washington Airport and Hoover Fields into one big airport of about 218 acres. At present, because of the road, it is necessary to use a stoplight system in order that pilots may take off safely. Motorists must wait until they get the green light to cross the runway.

* * *

AIR RECORDS: Al and Fred, flying brothers, were certainly the right KEYS to open the door of fame and they are now holders of the world's endurance record with a mark of 653 and one-half hours which passes the official record of 553 hours, 41 minutes and 30 seconds set in 1930 by the Hun-

XUM

ter brothers in Chicago and also the unofficial record of 647 hours, 28 minutes and 30 seconds made in St. Louis in 1930 by Forest O'Brine and Dale Jackson.

From beginning to end, the Key brothers record flight, made in their crippled and oil-stained "Ole Miss" at Meridian, Mississippi, was filled with thrills galore. On the 20th day in the air, Al had to have an abscessed tooth treated and a few days later, after flying through severe storms, fire broke out as a result of short circuit following a refueling contact.

It was necessary to cut the motor while the fire was being put out by means of a hand extinguisher which just about gave Bill Ward of the refueling crew heart failure as the plane lost considerable altitude before the motors could be restarted. On another occasion, brother Fred barely escaped being thrown from the "cat walk" while oiling the rocker-arms as his safety belt was unfastened when the plane hit an "air bump" and he came near losing his hold. Finally, when they signalled that they were going to bring "Ole Miss" to earth, the landing had to be made on one flat tire, a tense climax for the crowd of some 15,000 who watched the brothers bring the plane to a slow, perfect landing. . . . CONGRATULATIONS!

* * *

LIEUT. R. L. Burke, private pilot for Secretary of the Treasury Morgenthau, and Commandant of the Cape Cod Coast Guard Station, set a new world's record for amphibian planes with a load of 500 kilograms flying his Grumman Amphibian over a 100-kilometer course at a speed of 173.945 miles an hour, bettering the previous record of 159.781 miles an hour established May 15, by Major E. E. Aldrin, manager of the aviation division of the Standard Oil Company of New Jersey.

Distance records for seaplanes weighing 1440 pounds or less and those of 770 pounds or less were returned to America when Benjamin King of Washington and Dan Brimm of Port Washington, L. I., flew from North Beach, L. I., to Whitney's Landing in King's 36 horsepower Aeronca.

Robert Kronfeld completed the first London-Paris glider flight in 4 hours and 5 minutes, also establishing a new record for economy in air travel as the gas consumed in his motorcycle powered glider cost $1.50. . . . Mlle. Marsye Hilsz, noted French pilot, has established a new woman's altitude record of 38,714 feet. . . . Air France claims a new record of 60 hours and 50 minutes for South Atlantic commercial planes for the flight from Paris to Buenos Aires.

* * *

ATTENTION OF MR. RIPLEY: A Russian parachute jumper named Vokhonsky actually jumped UP when he stepped off and countered winds carried him along sideways for twenty-five

(*Concluded on page* 190)

Something Different in Aircraft

Side elevation of the novel Rahn airplane or flying-machine. Note the rotating feathering type wings just above the body.

THE Rahn Aircraft Corporation of Brooklyn, N. Y., has constructed a new type of airplane based upon entirely new principles of flying.

The embodiment of the Rahn principle of flying consists of rotatable wings as shown in the pictures, two on each side of the airplane, each wing has a spread of 6 sq. ft. which when set in operation, cause the flying machine to either ascend or descend vertically, or to fly in a horizontal or forward direction, without a propeller.

The rate of speed has not been specified as yet, but it is believed it will be near 75 to 100 miles per hour. The rotatable wings are powered by a Wright 240 Horsepower Supercharged Motor.

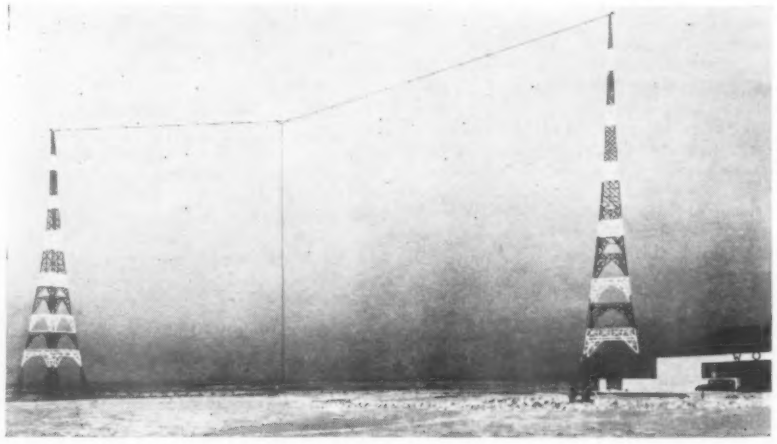
The advantages claimed by the inventor of the airplane are: No propeller noise, able to take off and land vertically on a space of its own proportions, also the entire plane is much smaller than the present day conventional type, it is about 15 feet long.

This seems to be a more logical solution of the rotating wing plane than the conventional side-wheeler type that has aroused so much interest in the past few years. At least the surface loading is symmetrical and does not introduce oscillating moments into flight.

Tower Lookout Automatically Warns Planes

DOUBLE protection against plane mishaps is provided at the new 385-ft. transmission towers of Radio Station WOR, Carteret, N. J.

A small transmitter, operated at the frequency of the radio direction beacon, warns transport pilots if they approach the towers. In addition, beacon lights on the towers and station roof are automatically lighted by a Weston Photronic Cell whenever the light intensity falls below a point of good visibility.



Here are the talking towers of Carteret, N. J.

Airline Operation in Sweden

by HOLGER LUNDBERGH

An interesting account of the new equipment employed on the Swedish Aerotransport lines. Fokker planes with American Wasp engines are employed.

SWEDEN has established a fine airline through the picturesque regions of this country which is interesting in view of the ultra-modern equipment employed.

Every comfort is supplied the air-traveler in the luxurious cabin which, unlike American transports, is divided into compartments or drawing rooms.

A Fokker Type F.XXII, in flight over the lines of the Swedish Aerotransport Company in Sweden. It is equipped with four 500 h.p. Wasp engines and carries a payload of 4,800 pounds at a range of 700 miles.

ONE of the largest, fastest and most luxurious of modern airliners has been acquired by the Swedish Aerotransport Company. Sweden's national flying concern, which maintains inland and foreign routes. The giant machine, a Fokker, Type F. XXII, will make regular trips between Malmö, in southernmost Sweden, and Amsterdam.

With a wing spread of nearly 100 feet and a length of 67 feet, the airplane has a gross weight of 28,650 pounds. The pay load is 4,800 pounds at a range of 700 miles and a cruising speed of 140 miles per hour. The machine is powered with four Pratt and Whitney Wasp T1 D1 engines, developing 500 h.p. at 2,100 revolutions per minute at sea level. The fuel consumption at cruising speed, or twenty miles an hour less than maximum, is 97 gallons an hour.

The engines are all built into the leading-edge of the wing, two on each side of the fuselage. A new type of plywood with a bakelite layer has been used in the wing construction, assuring a greater resistance against the effect of sun and humidity than that of ordinary plywood. The fuselage, shaped somewhat like an airship, is welded together from steel tubes, the oval section being obtained by bending the tubes. The covering consists of cotton fabric. In each wing is located a fuel tank of 300 imperial gallons capacity.

The cockpit is in the nose with seating accommodations for a crew of three. The seat of the first pilot is in the most forward position on the center line of the fuselage. This arrangement is new, and permits an unobsructed view in all directions. The co-pilot and the wireless operator are seated behind the first pilot. Equipped with dual-control, the airplane can be started, flown, and landed from either pilot seat.

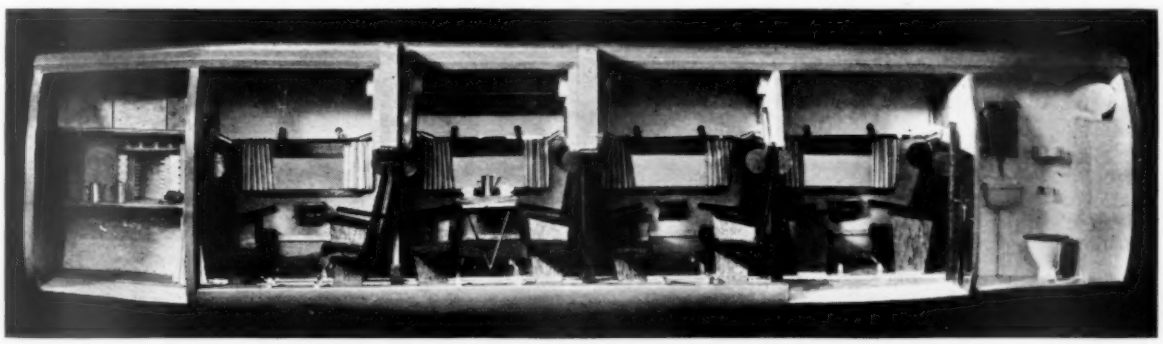
The instruments include the latest devices for blind flying, as well as techometers, manifold pressure gauges and distance temperature indicators. The radio station on board is a Phillips long wave transmitter and receiver for both telegraphy and telephony.

Of special interest is the luxurious equipment of the cabin, which accommodates twenty-two passengers. Designed by the Stockholm architect, Sune Lindström, the room is divided into four compartments or drawing rooms, similar to those on railway trains, and equally spacious. There are both sofas and upholstered mahogany chairs with black leather seats and backs.

The walls are covered with brick-red leather, and the arched ceiling with silver cloth. At each window is a small, built-in table, but when meals are served the steward provides a large, detachable one. In each compartment are three lights, one above the window, and two reading lamps over the seats.

Just back of the pilots' cabin is the pantry, equipped with running water, ice box and other cooking facilities which will make it possible to serve entire meals en route. In connection with the pantry is the large baggage room. At the other end of the cabin is the main entrance, and the toilet and wash room.

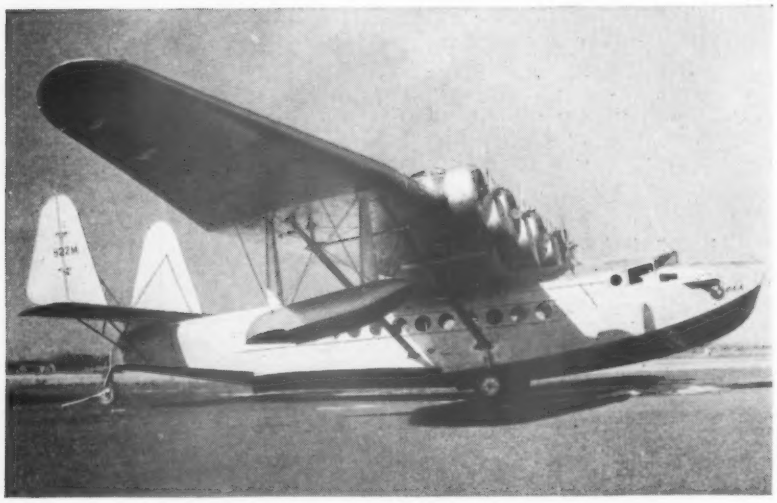
The Malmö-Amsterdam route was opened ten years ago. In 1925 only 1,851 passengers were carried, while the number was 16,920 in 1934. In Amsterdam connections are provided for planes to Hamburg, London, and Paris.



A longitudinal section through the passenger compartment of the Fokker Type F.XXII, showing the seating arrangement, the galley (at the left) and toilet accommodations (at the right). Note the excellent visibility through the wide windows.

XUM

The Marvelous History of



This is the Sikorsky S-42 of the Pan American Airways that holds ten world's records and which has made a double crossing between Hawaii and the United States.

by
ROBERT H. RANKIN

THE story of the founding and growth of a large commercial airplane is always interesting and that of the Pan American Airways is particularly so. Founded in 1927 as a 90-mile aerial ferry service, this system is today the largest in the world, having about half again as many route-miles as its nearest competitor—the British Imperial Airways.

In order to begin the record of Pan American, we must first briefly review the biography of the founder, Juan Trippe. In the year 1664, the Trippe family came to this country, settled in the eastern part of what is now Maryland, and for generation after generation gave its sons to seafaring professions.

Juan Trippe was born in 1900 and from his mother's Latin ancestors he inherited his Spanish first name and his dark complexion, both of which were to come in handy when he began asking airline concessions from some 30 South American and Caribbean governments. Mr. Trippe received his education from the Hill school and from Yale, and like many aviation executives he received his first flying experience during the World War. After his discharge from government service he graduated from Yale and then he spent several unhappy years with a brokerage concern in New York City.

Having an active dislike for the brokerage business and believing that there was a great future in commercial aeronautics he approached three of his friends, Cornelius Vanderbilt Whitney, William Vanderbilt, and Percy Rockefeller with a plan for forming a commercial airline. They agreed to help him and in 1926 United States Airmail Route No. 1—Colonial Airways (Boston to New York) resulted.

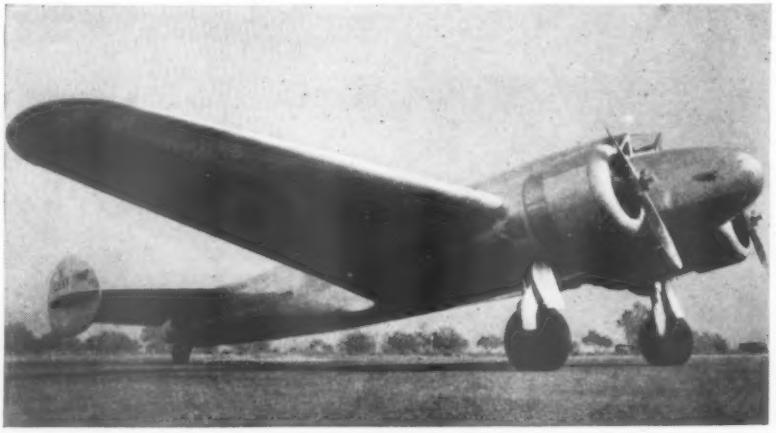
Then, a year later, in 1927, the company began business as the first international airline operating out of the United States. Thus, the Pan American Airways was formed, for that was the name given to the new airline. This system was actually only a 90-mile aerial service operating between Key West and Havana. Actual operations were held up for some time on the line until a little aircraft concern (the newly formed Fokker Aircraft Corp.) in New Jersey could complete the planes for the service.

These ships were the first trimotors to be used in regular mail and passenger service in this country. There were no American-made craft of this type being built in this country at that time, consequently, Tony Fokker had to set up a factory to build the first U. S. model of his then famous trimotored transport, the F-7. These were the "airliners" which launched the pioneer air service to Cuba.

Powered with three Wright Whirlwind motors of 200 h.p. each, these "giants" cruised at 90 m.p.h. and carried two pilots and eight passengers, that is if there was no mail. Of course, small mail cargoes could be accommodated on the ship, but most of the time, the air travelers had to give up their seats in favor of Uncle Sam's mail, as often there were 2,000 pounds carried on a single trip.

During the first year of its operation, Pan American boasted but seven planes and 118 employees, but some of these employees were pushing forward surveys on foot, by ox cart, by canoe and by plane, eastward through the West Indies to Puerto Rico and from Cuba westward across the straits of Yucatan and thence through Central America to the Panama Canal Zone—through equatorial jungles and swamps and up steep mountain sides.

In the many thousands of miles covered by these surveys, there were only five "airports" in existence and only four weather stations from which reports adequate for safe flying could be secured. There was no communication system through most of the country surveyed and no radio equipment had



This Lockheed "Electra," belonging to the Pan American Airways, is used in the Central American service.

the Pan American Airways

been developed by means of which aircraft could maintain dependable contact with shore stations through the difficult meteorological conditions found in the Caribbean.

Following these surveys, engineers were sent out to penetrate unexplored portions of the map to locate airports. Fuel had to be supplied to operating bases, many hundreds of miles from production centers and in many instances, gasoline had to be transported by Indian caravans over machete-hewed jungle trails.

In other cases, it was necessary to train natives who had never heard a locomotive whistle, to whom an automobile was a rare curiosity, to build airports for what they called "thunderbirds". Meantime, there was being constructed at Miami, Florida, the first great international air-terminal on this side of the Atlantic—the Pan American International Airport.

Hangars and machine shops were installed at the field, while in the large passenger terminal building the offices of the United States Customs, Public Health, and Immigration services were established to speed the clearance of passengers coming into this country from a foreign port. This work was completed during the latter part of the year 1928 and early in 1929, the terminal was opened and service started over the new routes. By the last of the year, the company had circled the Central Americas with airlines.

During 1928, the F-7's gave way to the newer and larger Fokker transports, the F-10's. Powered with three Wasp 400 h.p. engines, these ships could cruise at 108 m.p.h. and carry ten passengers and a crew of four. At this time Pan American developed their own radio equipment sufficient to enable them to maintain contact with their ground stations at Key West and Havana, and a licensed radio operator was added to every flight crew.

Juan T. Trippe, president of Pan American Airways.

A Martin Clipper Ship in its test flights. It is mammoth planes of this type that are under development by Pan American Airways for transoceanic traffic.

At the same time as this trimotor development, the airline was cooperating closely with various aircraft designers and manufacturers with the idea of developing an amphibian plane for operation on broken airways through Central America and the lower Caribbean.

As a result of this cooperation, the Sikorsky Aviation Corporation produced the S-36 a six passenger amphibian powered with two Wright J-5's. This was the first of the Sikorsky amphibians and also the first of that make of ship to be used by Pan American. Later the S-36 was replaced by the now famous S-38.

The S-38 carried eight passengers and a crew of two, and powered with its two Pratt & Whitney Wasp 420 h.p. engines it had a top speed of over 125 m.p.h. This particular Sikorsky model was an immediate success and it is significant to note that it is still the most widely used amphibian aircraft in commercial service. Using these ships and the new Fokkers, Pan American inaugurated service through the West Indies to Puerto Rico and from Florida to Nassau.

On September 15, 1930, Pan American purchased the New York, Rio and Buenos Aires Lines, Inc., and within the year by the purchase or consolidation of other airlines the Pan American system was serving the greater part of South America. During this time the first of the Consolidated "Commodore" flying boats was received. These marine transports, weighing 8½ tons gross and powered with two 550 h.p. Pratt and Whitney Hornet engines marked America's entrance into extended over-water transportation.

Carrying 22 passengers, a crew of four and a cargo of baggage and mail, these ships went into regular service during 1930. With a fleet of fourteen of these big ships in service, the line, flying routes through the West Indies, down the east coast of South America, and across the Caribbean from Kingston to Barranquilla, became the longest over-water airline in the world.

On the 1300 mile over-water route from North to South America it was important that larger and more efficient planes be put into service. Up to this time, as has been seen, the flying equipment of Pan American had been limited to ships of from 7 to 9 tons, and a cruising range of around 600 miles, and no plane manufactured in the United States could compare with the long-range flying boats developed in England for the India-Australia, or the South African routes.

Since there was need for large ships, in order to meet the competition of European concerns in South America, and since there had been no gradual development in this country from small planes to those of the size needed, it was necessary to bridge the gap from an amphibian of 8 tons to one of 17 tons in a single jump. An order was placed with Sikorsky for these large transports and it will be readily under-

XUM

stood that both purchaser and designer showed much boldness in attacking the financing and building of what was then the largest plane of its class and type.

Sikorsky, however, was equal to the task and the S-40 was produced. This ship is a high-wing monoplane amphibian of the same general type as the S-38, which is characterized by carrying the tail surfaces on a set of open out-riggers. Four direct-drive Pratt and Whitney Hornet engines of 575 h.p. each are mounted as tractors in nacelles hung below and forward of the leading edge of the wing.

A single "V"-bottom hull containing all the accommodations for 44 passengers and a crew of five, in addition to a load of a half ton of mail, is supported below the wing, and a pair of outboard wing floats lend stability on the water. Equipped with a fully retractable landing-gear and tail-wheel, the machine may be flown as a flying boat with considerable improvement in performance and with some 1800 pounds of additional payload available.

Christened at Washington as the "American Clipper" the first of these large ships went into service, making an impressive symbol of the bid of America for the aerial leadership of the world. After securing a license as both a flying boat and an amphibian, the wheel gear was removed from the machine and the "American Clipper", as well as its sister ships the "Caribbean Clipper", and the "Southern Clipper", became full-fledged flying boats.

In 1932, Pan American started purchasing airlines and routes which seemed to have no place at all in its South and Central American loop. In Alaska it bought Alaskan Airways, Inc., and Pacific International Airways. These lines spanned the Alaskan territory from Eagle on the Canadian border to Nome on the West Coast, and from Wiseman in the north to Anchorage in the south and to these was added a new 700 mile link from Juneau to Fairbanks.

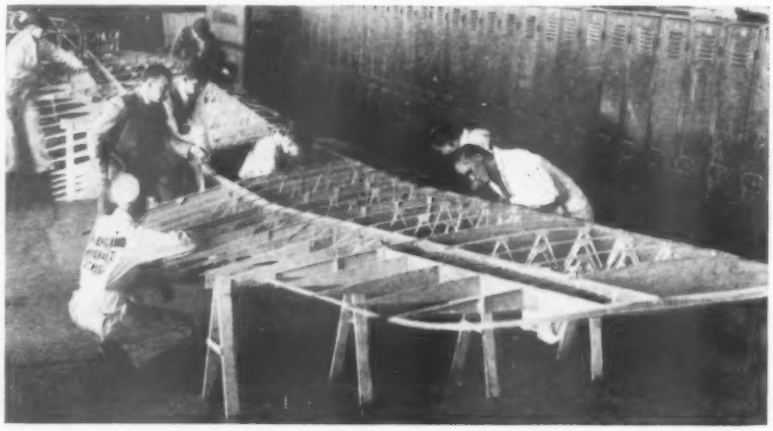
Then a year later Pan American joined with the Chinese National Government to form the Chinese National Aviation Corporation. This formed an aerial route south from Shanghai to Canton, north to Peking and west to Chengtu. For a time the public could not see just what Pan American wanted with these isolated places, but before long they began to realize that these lines fitted in perfectly with a scheme for a trans-Pacific service. Before long it will be possible for the world traveler to fly over a *single* air way from Buenos Aires to Peking, *a distance of a mere 18,000 miles.*

The plans for this service to the Orient were being made even while the "American Clipper" was taking shape in Igor Sikorsky's factory, and today with the establishment of bases at Honolulu, Midway, Wake, Guam, and Manila the preparations for the service are rapidly nearing completion. When

(*Continued on page* 200)

The Activities of Our Flying Clubs

We will be glad to have reports from all clubs that represent aviation in any way. These notes will be published at the earliest possible time.



If the membership is made to help out with the repairs they will usually be a little more careful in handling the club ship.

JUST to start the ball a-rolling, we will begin with the New Haven Aeronautic Association, 612 Washington Ave., West Haven, Conn., in whom we have a very personal interest as you will soon see.

This association is formed of POPULAR AVIATION readers that hold meetings every Wednesday evening to discuss the various aviation items mentioned in POPULAR AVIATION. According to their correspondent, Joseph E. Donovan, the club is planning to purchase a glider and start its practical field work from that point. They are intensely interested in airplane development and hope to boom amateur flying in New Haven, which they will no doubt accomplish. Thanks, boys, for your kindly message and we trust that you and the association will prosper.

* * *

LIEUT. L. V. RAWLINGS of the 44th Division Aviation, Newark Airport and flying instructor for the Flying Clubs of America, has announced to the membership that he had purchased a new Aeronca dual controlled monoplane for the club.

The Fying Clubs of America, a non-profit co-operative group of young men and women. Its chief aim, is to assist and enable young people to obtain a pilot's license at the lowest possible cost. The cost to the members at present is fired at three dollars per week and Lieut. Rawlings is confident that there will be no increase. The members are now receiving actual flying instruction in the air on this basis, which seems almost too good to be true.

While the first group, flying on this plan, has reached the minimum of the thirty members required, a limited number of applicants for this group are still being interviewed by Lieut. Rawlings at Newark Airport. Other similar groups will be found and additional airplanes will be procured as required. One feature of the club's plan is to install a two-way five-meter radio telephone in the airplane so that soloing members are in constant communication with the flying instructor on the ground and thus, errors can be promptly criticized and corrected.

* * *

WE HAVE had a considerable contact with Capt. James D. Ross, 6348 S. Marshfield Ave., Chicago, Ill., who is trying valiantly to establish the National Air Reserve in Chicago and the Chicago area. The N. A. R. is soliciting memberships among the high-school students and graduates between the ages of 16 and 21 years. Membership in this organization is absolutely free and there are no dues nor membership fees of any kind in connection with the membership.

The National Air Reserve does not take part in any political, religious or pacifist movements and accepts no patronage tendered by any persons or organizations. All activities of the members and officers must be voluntary. No officer of the N. A. R. shall receive compensation for his work in salary nor from the sale of commissions.

The N. A. R. urges the passing of the Junior Air Corps Reserve bill by Congress. This bill provides that the Junior Air Reserve shall become a part of the U. S. Army Air Corps. It further provides that any high-school graduate, between the ages 18 and 21, shall be trained by the U. S. Army Air Corps as a pilot, and when the student is graduated from such training, that he shall be commissioned as a member of the Junior Air Corps Reserve.

* * *

WE HAVE a letter from Frank F. McPeake, Jr., telling of the aviation clubs that he is organizing in nearly every city and town in the area of Metropolitan Boston. They are to be grouped as units under the Metropolitan Aero Club.

(*Concluded on page* 184)

Unshackling Flying Aptitude

by W. M. WOOD
2nd. Lieut. Air Reserve Corps

Here are some pertinent hints to flight instructors as well as to the student on the psychology of flying instruction. Read this over carefully, there are a lot of good ideas incorporated in the article.

WHEREVER flying training goes on there is talk of flying aptitude.

If you are a solitary student, paying for lessons by the hour, you go on as long as your money holds out, whether you have flying aptitude in small or large quantities. If you get along well you figure you have lots of it. If you have trouble, you think that perhaps you haven't got so much. And it doesn't worry you much.

But, if you are one of a group of students training at a commercial or military flying school you soon come to the conclusion that flying aptitude is an extremely important thing, a sort of heaven-given spark of genius which you either have or don't have and that's all there is to it. You wonder whether you have it or not, and you hope that you do. You start trying to figure out why some students can learn faster than others and you begin comparing yourself with various other students who have failed or who have succeeded.

In short, the student tries to discover the secret of flying aptitude in order that he may cultivate it. But he is usually baffled by the feeling that it is a mystery. All he can do is to try and work as hard as he can. That affords little comfort. He is distressingly aware that he is already working as hard as he can. If he is a student in one of the military flying schools and facing elimination, unless he is in the best half of his class, he is acutely aware that everybody else is also working as hard as possible. So it seems to boil down in the end to that old business of flying aptitude. You either have it or you haven't and that's all there is to it.

And so it is to some extent, no doubt, but it seems to me that the importance of flying aptitude is greatly exaggerated. The term is used to cover up a lot of thoughtlessness in regard to why one student can learn faster than another.

My belief is that this inherent and therefore unalterable flying aptitude, if considered exactly as the student's primary nervous equipment, has much less to do with the student's progress than the conditions under which his nervous equipment is permitted to function. Almost every reasonably young person, who can meet the physical requirements of a flying student, has primary nervous equipment of adequate quality.

The capacity to develop new nerve channels; to become sensitive, for instance, to slight forces which tend to slide or bend one to one side or the other, is something that most healthy individuals of average intelligence have.

Some people may have the capacity to develop these new nervous functions more rapidly than others, just as some people can learn to play the piano more quickly than others. But the nervous equipment necessary in learning to fly is much more a thing which practically everybody has than is musical talent.

When flying students make poor progress, the trouble often is that flying aptitude is prevented from developing rapidly and fully either by obstructions

There is nothing like formation flying to demonstrate flight ability, or aptitude. Formation flying is the final analysis.

of an emotional nature, or by lack of the best use of the mental faculties, or by both.

Ordinarily slow progress which is really due to these causes is loosely attributed to lack of flying aptitude, and the whole business remains cloaked in mystery. But considered from the psychological point of view as a combination of basic nervous, emotional, and mental factors, lack of what is loosely lumped under the head of "flying aptitude" loses much of its mysterious nature and becomes something which can in a large measure be nurtured and developed.

I don't mean to say that I think just any student can be made into a crack pilot merely by having attention paid to his emotional adjustment and the way he uses his head. I simply say that these are very important factors in what is loosely called "flying aptitude," and that attention can be given to them with great benefit to the student.

I believe that many flying instructors are deficient in this respect. I know that the army instructors whom I knew seemed for the most part to know little and to care less about their students' feelings and mental processes. I was fortunate, during a critical period of my primary training, in having an instructor who, because he was just beginning his instructing career, was particularly anxious for his students to make a good showing. In addition he was intelligent and thoughtful to an unusual degree. He did help his students to make adjustments, though in something of an awkward fashion, which is understandable when it is remembered that he was pioneering in the art of applying psychology to flying instruction.

I think he was conscious merely of being unorthodox. Certainly he was different from the typical yelling impatient instructor who tells a student how to do a thing and bawls him out if he doesn't do it right. Commercial instructors may not treat their paying students so rough, but most of them no doubt could study their problems very profitably from the psychological angle.

The problem of emotional adjustment is mostly one of getting rid of hindering and cramping anxieties. The fear of flying itself, or rather of "falling," doesn't give us much concern. Very few people who voluntarily take flying lessons are afraid to fly. The most common sort of fear is that of failure, of not doing the right thing, of eliciting the instructor's disapproval.

This is sometimes the result of an habitual tendency to feel inferior and, of course, where the habit is too well established little can be done about it. But the fear which is natural even to normal people facing new and strange demands can be rapidly eliminated by applying the principle of suggestion.

Both student and instructor must adopt the habit of thinking, or in the case of the instructor of at least seeming to think, that the student is as good as or better than the average and that the errors and deficiencies are no more than to be expected and industriously and intelligently eliminated. Self-confidence is of primary importance and must be cultivated, especially at first.

Every student hears a lot about tenseness, how beginners have been known

to "freeze on the stick" and other such things. He should simply forget it and enjoy flying. If he finds himself tense, he should simply relax all over and tell himself that doing the thing exactly right is not really so important after all. He should get rid of the feeling that the plane is a fearful thing which is continually fighting against him, and that he must do everything in exactly a certain way in order to prevail against it.

Instead, he should think of the ship as something that belongs to him and not to itself nor the instructor, as a gladly obedient thing over which he has absolute control. With that attitude toward the ship he can set out to experiment freely with it—at safe altitudes—and to find out just how it behaves. Even before solo the instructor can let the student play with the controls in this experimental fashion. It helps the student to develop the self-confidence that comes only from feeling that the ship is absolutely subject to his command.

Almost as obstructive as the fear of making mistakes is another complex which is closely related to it. This is the feeling of compulsion to work hard, to make rapid progress, to get ahead faster. In the military schools it arises from the knowledge that the ones who learn fastest have the best chance of sticking. Commercial students paying for time by the hour may want to get the most possible for their money.

In my class at the Air Corps Primary Flying School, I noticed that those boys who set the most store by getting through seemed to have a harder time than others who were more happy-go-lucky. Some of my classmates had been trying for years to get appointments as flying cadets. All the talk of washing out got on their nerves and made them work too hard. Others who took the whole thing as a sort of lark got along much better. I'll never forget what my instructor told me one day when I was getting worried about not being sent up for my twenty hour check.

"Flying is a lazy man's job," he said. "Just take everything easier." I remarked to myself that according to that the job sure fit me, and acted the part. It helped.

In just such ways as this the student and instructor can make use of the powers of suggestion to remove emotional obstructions which prevent the full use of the student's natural ability.

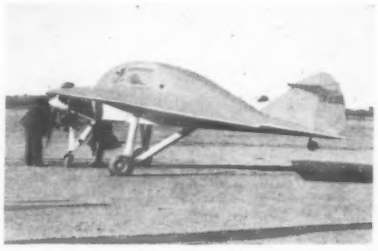
Of course, there is the student who apparently has no fears or inhibitions at all, who has too much self-confidence, who is afflicted with the daredevil complex.

Though such students often think they are better than they are, most instructors will agree that it is easier to make good pilots out of them than it is to teach anxiety-beset students to fly in a mediocre fashion. That fact merely indicates that the instructor

(*Concluded on page* 187)

A Low Aspect-Ratio Plane

by RAOUL HOFFMANN



Side elevation of the Arup.

Showing the 70 h.p. LeBlond engine.

I HAVE finished and tested a new type low aspect-ratio monoplane for the Arup Mfg. Co., South Bend, Ind., which was the fourth one built. One plane previously built was destroyed by fire before any performance data could be obtained.

This new monoplane, a two-seater with dual controls and powered by a 70 H.P. LeBlond engine, has shown remarkable flying qualities characteristic of the low aspect ratio airfoils. It is a near all-wing airplane with the exception that it has horizontal tail surfaces of 23 sq. ft. above rear end.

It has a span of 22 ft., an overall length of 19 ft., a maximum cord of 16 ft. and an empty weight of 675 lbs. The center frame and the two star shaped spars are constructed of chrome alloy steel tubing, the ribs of dural tubing, the entering edge and the rear trailing edge of dural sheets. The fabric covering is stitched to the upper and lower cord of the ribs independently.

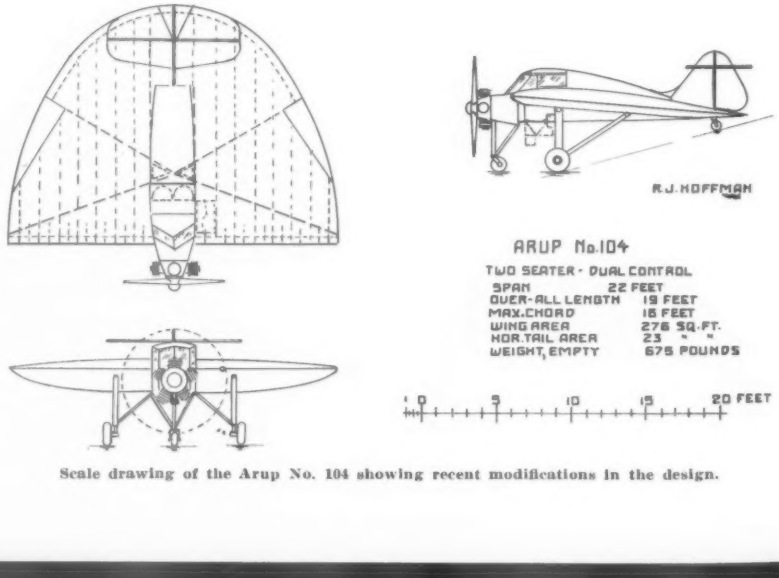
The emergency exit is located over the pilot and passenger seats, entrance being through the bottom, using one part of the wing and a part of the body. The door on the body has a step attached and flaps downward to facilitate entrance into the machine.

The landing-gear follows the specification of the Bureau of Air Commerce for a third wheel to prevent nosing over after full brakes are applied. The spread of the side wheels is 8 ft., the wheels are 18x8 airwheels with brakes. The shock struts are of Bendix make with a travel of 9-inches. The front swivel wheel is a 12"x5" airwheel.

Two gas tanks are located behind the seats, with a capacity of 18 gals., and are connected with a fuel pump to the engine. The propeller has a diameter of 7 ft. and only 3'-3" pitch, which insures a quick take-off but reduces the top speed.

The easy handling in the air, a gliding angle of 1:2.6 at a gliding speed of 23.4 M.P.H. (one pilot only), insures a safe landing especially in a forced landing; a top speed of 86 M.P.H. has been obtained at the first run, but with a correct pitch a top speed of 100 M.P.H. will be reached. The take-off in a 15 M.P.H. wind is accomplished in 3 seconds and in still air in 5 seconds.

This machine and all other low aspect ratio monoplanes give hope for improvements on speed performances and has aroused a new interest for radical designs in this country as well as in foreign countries, such as France, England and Italy.



Scale drawing of the Arup No. 104 showing recent modifications in the design.

We Thought So----

THE following clipping, taken from the bulletin of the British Aircraft Manufacturers' Association, is significant. It proves without a doubt that all is not as it should be with American built warplanes. If American planes cannot meet foreign competition, where performance is a paramount issue, then what can we expect of these planes when delivered to our own government where competition is not so severe? If our planes cannot take off at 10,000 feet, and there are many high elevations in the United States, then just what can we expect from an air force equipped with such planes?

* * *

THE reputation in Latin America of British aeroplanes and aero engines is greatly enhanced following, in the words of the aeronautical correspondent of "The Times", "a comedy of emulation in which British and American military aircraft took part."

Some time ago, the Fairey company secured an important contract from the Peruvian government in the face of heavy competition from firms in the United States and France. The machines supplied were Fox two-seat biplanes, each equipped with a single Rolls-Royce Kestrel 525 h.p. liquid-cooled engine.

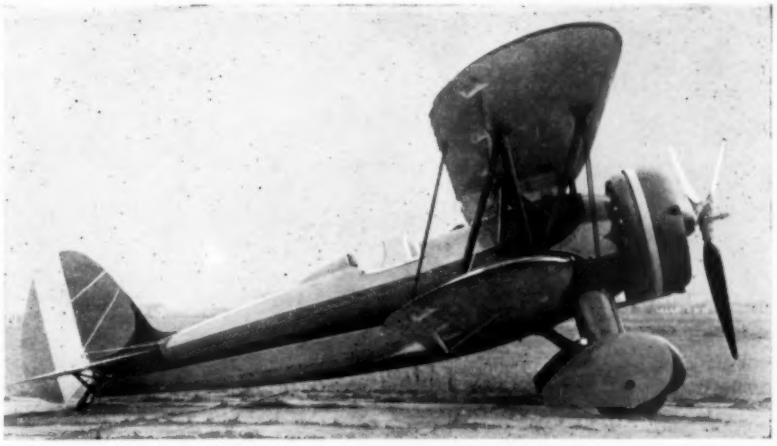
As soon as they were taken into service, a series of flights was begun to test their capacities in range and transport of military load, and thus to provide the air staff with information on which their future use might be based.

One of these flights took them from Lima over the Andes to Cuzco, 360 miles away and 11,700 feet from sea-level. There the fuel tanks were replenished, the Foxes took off again with full load on board and flew back to Lima in formation at an average speed of 180 m.p.h.

This performance moved the Americans to attempt emulation. American single-seat fighters, of a well-known make and equipped with 700 h.p. engines, were prepared for demonstration and flown from Lima over the Andes to Junin, which is 80 miles from Lima and 10,000 feet up. There the flight ended, because the aeroplanes were unable to take off again in the thin air at that height. Many attempts to take off were made, but all of them failed and finally the machines were dismantled and packed in crates for an ignominious journey by train back to Lima.

Evidently, the Peruvians chose wisely when they decided to acquire the British machines. Warplanes that cannot escape under their own power, no matter how lightly loaded, from aerodromes located at heights of 10,000 feet or more, are of little use in the northwestern states of Latin America. Indeed, the "Times" story gives good reason to doubt their efficiency for military service in any conditions.

Caproni "114" Advanced Training Plane



Side elevation of the Caproni Advanced Trainer "114".

TWELVE of these new Caproni biplanes have been delivered to the Peruvian government for advanced acrobatic training or as high altitude single-seat fighters. It is the type of plane with which the world's altitude record was obtained in 1934.

It is a single-bay equal-span biplane, fitted with a Bristol Mercury IV-S2 engine. The engine is cowled with a normal chord Townend ring in conjunction with a rear exhaust ring. With this engine, speeds of 180 m.p.h. at sea-level and 157 m.p.h. at 16,400 feet are had.

A New English Avro Sportplane

THE Avro "Commodore" is a luxuriously appointed four-seat cabin plane designed for the private owner or for commercial operation. It is powered with a Siddeley Lynx engine delivering 215 h.p. and has a maximum speed of 130 m.p.h. with a cruising speed of 110 m.p.h.

The Commodore is a heavily staggered biplane of metal construction throughout. Welded steel tubing is used for the fuselage while the wings have steel spars and aluminum ribs. The external covering of doped linen is the only non-metallic item.

All of the controls—engine, rudder and brake controls are fully duplicated while the ailerons and the elevator are operated by a stick in such a manner that the control can be swung and handled from either front seat.

SPECIFICATIONS

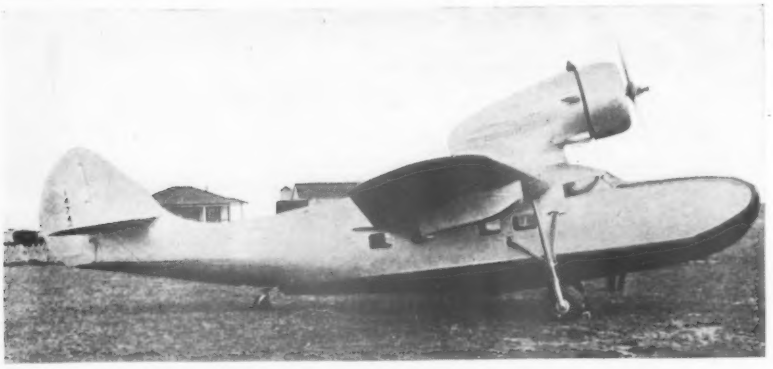
Wing span	36'-0"
Length overall	27'-3"
Height	10'-0"
Total weight	3,500 lbs.
Net weight	2,225 lbs.
Service ceiling	11,500 ft.
Duration	5-hrs.

The wheels have medium pressure tires and brakes. A full in castoring tailwheel is used which is fitted with a low pressure tire. The wheels are enclosed in aluminum fairings.

This view of the Avro "Commodore" sportplane calls to mind certain American ships of this type.

The Fairchild High-Speed Amphibian

(See front cover)



Side elevation of the Fairchild high-speed amphibian showing its clean lines and simple landing gear.

THIS single-engine amphibian, of which six are to be constructed for Pan American Airways, has a maximum speed of 179 m.p.h. and a cruising speed of 158 m.p.h. They are intended for the Amazon River Route extending from Para to Manaos where both water and land operations are necessary.

At cruising speed it has a range of 750 miles with a load of 1,000 pounds of mail and express in addition to the eight passengers and the crew of two men. It is powered either by a 670 h.p. Wright Cyclone or a 650 h.p. Pratt and Whitney Hornet, the latter engine being installed on the first test ship. It is an all-metal stressed-skin design with a semi-monococque hull.

SPECIFICATIONS

Wing span	56'-0"
Wing area	485 sq. ft.
Length overall	46'-0"
Weight empty	5,500 lbs.
Payload	2,445 lbs.
Gross weight	9,600 lbs.
Useful load to gross weight	42.7 pct.
Rate of climb	900 f.p.m.
Service ceiling	18,000 ft.
Take-off time on water	36 secs.
Take-off time on land	16 secs.

The engine nacelle, the result of many wind-tunnel experiments, is of welded chrome moly steel tubing, connected with the wing structure at three points. The engine is mounted in rubber bushings which reduce vibration without any fore-and-aft movement. A full N.A.C.A. cowl is faired into the nacelle.

The Morane-Saulnier Record Holder

THE FRENCH Morane-Saulnier monoplane shown below is the plane on which the women's world's altitude record was broken recently by Miss Mary Hilsz. It is fitted with a Gnome-Rhone rotary engine which was souped up from 420 h.p. to approximately 480 h.p. The sweep-back suggests the Hawls.

This model of the Morane-Saulnier, a French production, suggests bullet streamlining with a considerable amount of sweep-back to promote high altitude control.

Quentin Roosevelt

SEVENTEEN years ago, young Quentin Roosevelt fell to his death on the battle-torn fields of France while performing an act above and beyond the call of duty.

Only a rude cross, made from a propeller, marked his grave when the Allies found it at Chamery, France. But now a memorial fountain has been erected in the peaceful little village, from which the last echoes of big guns have long since died.

In the nearby Methodist Memorial Museum are pieces of the airplane in which Quentin made his last flight. The largest piece is the engine. The propeller is sheared off and the rotary cylinders are smashed and dented from the terrific impact of the plane's diving into the ground. Jammed against that motor, the broken body of the gallant flyer was found.

Quentin had taken off from his airdrome with four other members of the 95th Pursuit Squadron on the 14th of July, 1918. Intermittent rain and low hanging clouds all across the desolate front lines made conditions anything but favorable for flying. The big push of the Marne Salient was on.

Quentin and his formation crossed the lines just a little east of Chateau Thierry. Their mission was to go down on the carpet and strafe enemy troops marching up to the front. They were cold meat and they knew it.

It wasn't long before the Fokkers were buzzing around them as thick as bees about a hive. Quentin's formation turned and took on a formation of seven of the coffin-nosed ships. A terrific dogfight ensued.

In the midst of the melee of turning, twisting, firing planes, Quentin caught sight of a large squadron of enemy planes diving to attack the Americans from the rear. They were outnumbered badly enough already, but these additional enemies would make it hopeless. The whole flight would be wiped out. Quentin immediately began climbing towards them to divert their attack to himself.

His comrades did not know that he had left the formation. Suddenly, they saw an American plane come hurtling downwards out of control, falling directly through the midst of the dogfight.

That night a radio message was received from the enemy stating that Quentin's formation had bumped into Richthofen's circus and that it was Sergeant Thom, an ace with 24 victories, who had got in the fatal shot. Young Roosevelt was buried with full military honors on the very spot where he had fallen by the German airmen against whom he had fought.

Today the slab that covers his grave bears this inscription:

"On this spot fell Quentin Roosevelt, son of ex-President Roosevelt, July 14, 1918. 95th Aero Squadron. He has outsoared the shadow of our night."

Developing Ideas at Wright Field

by JOHN C. A. WATKINS

The little known Materiel Division of the U. S. Army is instrumental in developing much of the scientific and engineering equipment used by the army and in civilian life as well. It is one of the most important departments in the service yet has received but little attention from the press.

WHO perfected that radio compass which guided John Blank, famous pilot, in his record-breaking flight? Who evolved the new parachute that is now the faithful friend of every aviator? Who helped make it possible for pilots of open airplanes to make winter flights in more comfort?

If you ever made a trip through Wright field, the army air corps' great experimental center in Dayton, Ohio, and you were a little more observant than the average visitor and were especially privileged so that you were shown things the ordinary person never is permitted to see, you would get the answers to probably sixty percent of the thousands of questions which could be asked as to the origin of most of the equipment now in use in military and commercial aviation.

No matter what the new gadget is, no matter how great a gift it is to aviation, or how unimportant it may seem to the layman, it is reasonably safe to say that the engineers at Wright field either partially or wholly developed it or, at least, received it for test, and without charge, submitted to the maker constructive criticism upon it.

Day after day, underpaid, unsung, unknown, those engineers work in their laboratories, making it possible for you and me to fly in safety and with perfect confidence in our airplane.

Despite the entirely natural secrecy which must surround the great majority of this work which is, after all, primarily for military purposes, although most of its results are passed on to benefit aviation in general, certain information on the field's great activities must leak out. And, despite the army air corps' policy of discouraging the publicizing of individuals, some of those men have performed such great feats that they are, policy or no policy, public figures.

Of the fifteen or so branches at Wright field, the most interesting from the non-technical point-of-view, and one of the most important, is the one devoted to the development of equipment. In the equipment branch have been, and are, some air corps officers and civilian engineers whose names are by-words in the aviation industry.

Until just recently Captain Albert Hegenberger, distinguished air corps officer whose feat, with Lt. Lester Maitland, of being the first to fly from the United States to Hawaii, is only eclipsed by his remarkable and historical perfection of a blind landing system, practically foolproof, which will not only revolutionize air travel, but which has been adopted by the bureau of air commerce as its standard for all American aviation, was in the equipment branch.

Captain Hegenberger has, as this is being written, been ordered to Washington, D. C., so that he may supervise the installation of the necessary equipment for the blind landing system on airports all over the country.

Lt. Colonel E. L. Hoffman, whose parachute is known to and worn by nearly every aviator, was, until his transfer to Brooks field, Texas, a few months ago, the head of the equipment branch. The giant 80 foot parachute,

Geoffrey Kruesi, inventor of the Kruesi radio compass and one of Wright Field's radio engineers.

with 184 shroud lines, which is to be used to lower the gondola of the air corps-National Geographic society stratosphere flight, should the bag burst as it did in 1934, is perhaps Colonel Hoffman's most spectacular product.

Another officer in the branch—an officer all aviators admire and respect—is Captain Albert W. Stevens, one of the world's leading authorities on aerial photography, noted designer of aerial cameras, and a "stratonaut", as stratosphere flyers are now becoming known. In this branch parachutes, instruments, landing and flood lights, aerial photography projects, and scores of others are developed. There is research being carried on on almost every conceivable piece of equipment used in the air.

The aerial photography group, headed by Captain Stevens, the material division, under which all air corps activities at Wright field are grouped, has many outstanding achievements to its credit. Perhaps, the most important application has been in mapping and surveying. For mapping purposes, the United States is divided by the government geological survey into quadrangles, each quadrangle covering an area of about 300 square miles. Formerly it required several seasons of slow, tedious and sometimes inaccurate work to map one quadrangle. Now, by airplane, and using one of Captain Stevens wide-range vertical cameras, it is possible to cover one of these sectors with overlapping aerial photographs in a few hours, with great accuracy and a tremendously reduced cost.

It is said that some parts of this country have never been accurately mapped: Captain Stevens and his assistants have made it possible for us to have a clear, pictorial record of what our country actually looks like—what its contours are!

Highly sensitized films that photograph through haze, smoke and fog, details which are invisible to the naked eye, have been developed in the photographic unit. A series of highly perfected mechanisms have made possible the development in the air, before landing, of negatives exposed during flight. Think what this would mean in time of war, when seconds count, or better still, for peace-time purposes, such as in newspaper work? Already a great newspaper, The Detroit News, has purchased an airplane fitted with a dark room, for developing pictures while flying back to the office. Speed, speed, speed is the newspaper cry, and the air corps is doing its bit to provide just that.

Material division photographers, and this usually means in the air corps' modest manner, Captain Stevens, have made photographs from the highest altitudes and greatest distances of any in the world, with cameras designed, improved, or collaborated on at Wright field.

Captain Stevens, if you remember, was the first man to photograph the curvature of the earth and has made the longest distance pictures in the world, snapping mountains from more than 200 miles distance—so far, in fact, that the mountains were invisible to Stevens, who had to point his camera in their general direction, and hope they would be included in the photograph.

With careful plotting of direction, what would this mean to our country in time of war? Think of the ease and safety, which is the paramount thought with which photos of enemy gun em-

placements, munitions dumps, and other facilities and bases could be made.

It might be well to digress from the technical part of this work, merely to say a word or two about Captain Stevens—Photographer, scientist and stratonaut. Words really can't do this lovable man justice. Completely unaffected by his deserved fame and the honors heaped upon him, Captain Stevens lives for his work. He spends hours in his laboratory and then, when the ordinary man would be a physical wreck, curls up on a table to catch a few winks of sleep.

Tall, lean and stooped, his principal worry is that his subordinates will not get credit for their work. A short time ago, the writer had occasion to get some information from Stevens for a newspaper article. When asked, Captain Stevens, politely but firmly refused to pose for a photograph, insisting that his workmen, engaged in preparing the Dow metal stratosphere gondola at Wright field, be pictured at their work. He said they deserved some publicity—he'd had too much! So we took their picture.

It is said of Captain Stevens by his close friends and not inaccurately, that one reporter makes him nervous, two make him very uneasy, and three or more scare him to death. This illustrates the extreme shyness and lack of affectation of this really great man.

Getting back to the work, the equipment branch of course does many more things than just camera work, important as that is. Improved lighting installations for flying fields, landing lights for use on airplanes and engine starters are some of the items of electrical equipment under improvement.

Aviators' clothing, kit bags, life rafts which may be inflated and set afloat in case of forced landing at sea or on other great bodies of water, life-preserver cushions for over-water flying, and many other similar projects occupy the attention of the group of engineers, officers and civilians, assigned to the development of parachutes. Other groups are responsible for transportation equipment, radio and the volume of complex instruments used in flight and as ground test equipment. Other miscellaneous projects—oxygen equipment for high altitude work, for instance—form part of the work for the unit.

One officer is engaged in discovering which leathers are the warmest and best for use in manufacturing winter flying suits.

An interesting investigation, necessitated by the extreme noise of high-powered engines and propellers turning at great speeds, all considered in connection with the increasing efficiency of anti-aircraft sighting and listening devices and long range anti-aircraft guns, is that of the reduction of those noises. Maneuvers held in 1932, Patterson field, adjoining Wright

(*Concluded on page* 192)

Two Men in a Plane Shoot Snaps

by SPEED WESTPHAL

A Metropolitan News Shot of the big Stockyards fire.

THIS is a story of two men, not just two ordinary men, believe me. These men are responsible for the growth and success of several of the largest airlines in the United States.

Back in the days when an Airline was a company which could boast two planes capable of carrying passengers from one point to another, the passenger list was usually made up of courageous millionaires. The price of a ride from New York to Chicago, in round figures, looked very much like the National debt.

Large Corporations thought too much of their high-salaried Vice-Presidents and Sales-Managers to even think of sending them by air to sales-meetings or conventions in other cities. City, State and Government officials were not allowed to do any skipping about the ozone, and the sixth paragraph of a movie star's contract read "Thou Shalt not fly."

True, at that time, good old Mr. Public was air-minded. However, it seemed that he was quite willing to stand on the side-lines and watch the proverbial stunt-man do the flying. Air-Travel was looked upon as reckless expensive and an almost certain method of allowing your beneficiary to collect on your policy. As a matter-of-fact, the insurance companies got very uppish and called you dirty names, if you as much as looked twice at the same plane.

If air-travel was to be eventually a success, it would have to be proved safe and placed before the public as real competition to the railroads. This was a large order for Mr. Publicity to fill. Surely, this took reporters and photographers with a knowledge of aviation and public understanding. So enter my two friends, Mr. Mike Rotunna and his

(*Concluded on page* 197)

The same fire but with the plane banked up sharply.

Air Raids On Mosquitoes

by S. R. WINTERS

An interesting account of the methods being adopted by the government for fighting our worst insect pest—the mosquito. The airplane method is by far the speediest and most effective weapon.

MILLIONS of dollars have been disbursed by the United States Government in an intensive and far-reaching war against mosquitoes, a foe that is not only a torment and a nuisance but also dangerous as a conveyor of malaria, yellow fever, filariasis and dengue.

Mosquito control programs are now being carried on all over the country under the Federal Emergency Relief Administration, the United States Bureau of Entomology, and the United States Public Health Service.

Under the Civil Works Administration, a pest-mosquito control program was initiated and was continued under the works division of the State Emergency Relief Administration. Almost $2,000,000 was disbursed in this cause in 32 states and the District of Columbia.

This project particularly involved the elimination of breeding places by cutting approximately 2000 miles of ditches, clearing 400 miles of stream banks and 7600 acres of bush in order to prevent standing water.

With funds granted through the Federal Emergency Relief Administration, the Bureau of Entomology and the Public Health Service are cooperating in an expansive project now in progress. The first and most important step in the program is the problem of drainage.

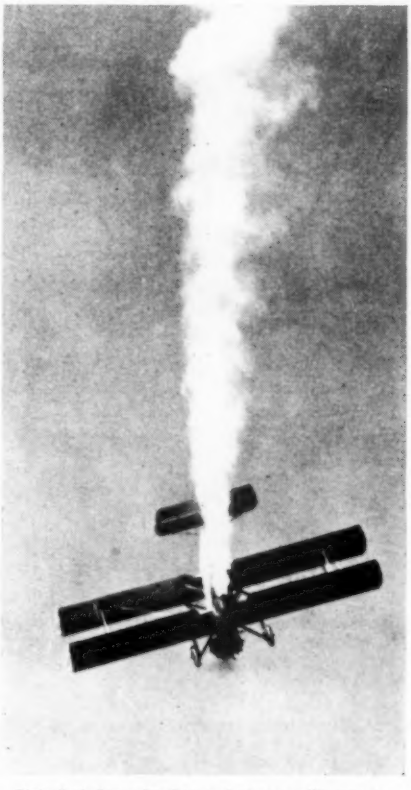
Mosquitoes, particularly the anopheles, or malaria-carrying mosquito, breed in clear still partly shaded waters and the workers first set themselves to the task of eliminating all these breeding places wherever drainage was practicable. The records show that 3,277,150 acres of swamps have already been drained, requiring 28,363 miles of drainage ditches and affecting more than 34,000,000 persons.

In some places, as in the low flat regions of the South where drainage was not possible, all foliage is being cleared away from the banks, all floatage removed and the water is being sprayed with oil and paris green. Spray pumps are used for this purpose and may be seen attached to the back of a small motorboat, on the backs of laborers or set up in motor trucks.

A novel and very effective method of combating these pests by spraying is through the medium of the airplane. This work of extermination was initiated at Bamberg, South Carolina, where five hundred pounds of paris green, with an equal quantity of soapstone, was scattered over an area of 500 acres by a plane equipped with a plain metal hopper with a sliding valve opening into a venturi tube.

The results obtained from this dusting were most heartening and it was found that it was unnecessary to go to the expense of clearing out vegetation as the plane, skimming the tree tops in even paths about an eighth of a mile apart, dusted the area as perfectly as could be done. The mixture of paris green and powdered soapstone, when applied from the airplane flying over dense vegetation, penetrates the vegetation and reaches the surface of the water in lethal doses.

The airplanes used for mosquito dusting at Quantico, Virginia, have all been service types, and such alterations as were necessary were made by the personnel of the Marine Base. The NB-2 airplane, manufacturd by the Boeing Airplane Company, was in use for some time, but has been replaced by a T4M, a torpedo plane, manufactured by the Glenn L. Martin Co. The use of this plane made possible the installation of a large hopper, carrying 800 pounds of paris green and soapstone.



Not shot down in flames but spreading mosquito poison over the marshes.

Much experimentation was tried until a satisfactory arrangement was found. The hopper is installed in one bay of the airplane, as near the center of gravity as possible, so that the releasing of the powder will not affect the stability of the plane in flight. The outlet of the hopper has a venturi arrangement.

The wind entering the open forward section serves to blow out the dusting material which sifts from the tank to a narrow neck which extends below the fuselage of the plane. The after section tapers outward so that the poison reaches a spread of 40 feet beyond the tail of the plane.

In Haiti, the Marines have a Fokker Transport plant equipped for mosquito dusting which carries 600 pounds of material. In Nicaragua, the dusting is performed every ten days during the year.

Another method of protecting persons in malaria-infested areas is that of screening homes. This work is carried on under the Public Health Service by relief workers. Not only are the doors and windows screened, but every possible opening carefully and tightly screened. Naphthalene balls are hung in the chimneys to assure complete protection from these dangerous mosquitoes. As the anopheles travels abroad only at night, this careful screening program serves very well to protect prospective victims.

A novel mosquito trap to save time and effort in campaigns against the annoying pest has been developed by the United States Department of Agriculture. Examination of the catch in a trap set at night shows what kind of mosquitoes infest a given locality and which are most abundant. This information makes it easy to locate the breeding places and plan an effective control program.

The new trap, which was perfected by Dr. T. J. Headlee, consists of an iron cylinder, at the front of which is mounted an electric light bulb with a reflector behind and an electric fan back of that. A fine wire screen closes the rear of the cylinder. A cyanide-collecting jar fits into the cylinder just below, and in front of the screen.

The cylinder is equipped with a windvane and is mounted on a ball-bearing device so that it always faces the wind. An ordinary 110-volt circuit supplies the current for its operation. A clock and switch device will turn the machine off or on.

Twenty of these traps were operated under the general direction of the Federal entomologists in the Chesapeake Bay region. Three thousand mosquitoes were caught in one trap during one night. These traps are used, not to control the pest, but to obtain a true picture of its prevalence.

A great benefit derived from this activity is the development of interest among a large group of men in the betterment of health and living conditions in their communities and the training of a corps of entomologists and engineers in mosquito control work so that they will be available in the future as local communities undertake mosquito control work.

XUM

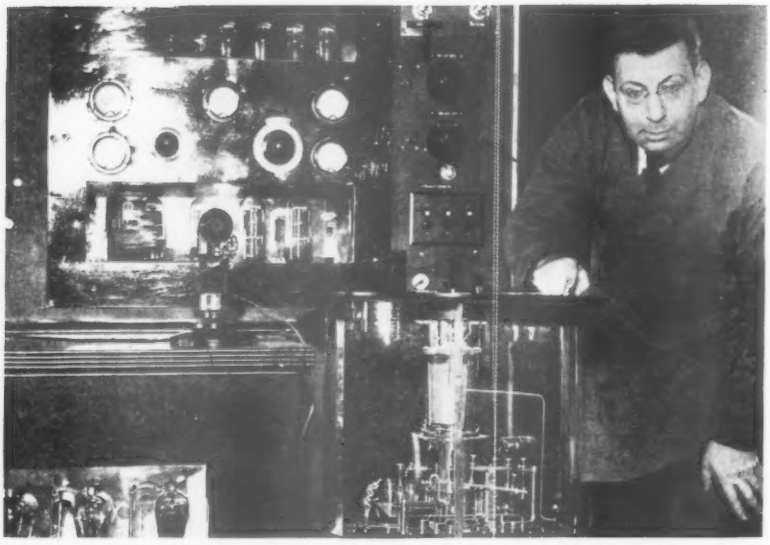
The Mirror of the Sky—

by

RALPH SHAWHAN

and

JOHN BENNUS



Dr. Spitz pointing to the Binaural indicator. The sound emitted by the airplane transmitter is picked up and relayed to the binaural indicator which gives the plane's direction and the Divergence wavemeter which gives its distance.

HOUR by hour, day by day, week by week, year after year, aviation science moves on. On to new records, new triumphs, new laurels.

Surmounting obstacles, crashes, death, weather, Nature's laws in many instances, man pushes forward the most thrilling, daring and important adventure in modern times.

But back of it all is the eternal search for greater safety, more assurance that the intrepid pilots who handle the controls will come back, will land safely or if they miss that—so that they can be found and rescued.

Headlines flash the news of a new hero's conquest, his smiling photograph greets you from the front pages. But in the background are the men of science who have largely made possible the new records. They lead in the search for safety. It is they who create something new and then others test the apparatus to discover if it is good, if it is practical.

Most recent in the science of aviation is the invention of Dr. Samuel Spitz, Los Angeles, California, who has offered the Spitz Flight Recorder, already referred to by aviation experts as "the mirror of the sky". Just what will be the limitations of this startling new invention by the man who gave the maritime world the Marimeter, or the depth sounding device used for charting the ocean's floor, can hardly be imagined. This is a simple explanation of the Recorder:

By means of a small light, actuated by short-wave radio impulses, a light moves across a strip map of the plane's route, tracing with minute accuracy its movements. The sound of the propeller on the airplane is picked up by two small microphones installed on the plane and through the plane's radio transmitter, the sound is relayed back to the terminal or base of operations where it is picked up by an automatic tuning device and thence to two new revolutionary instruments:

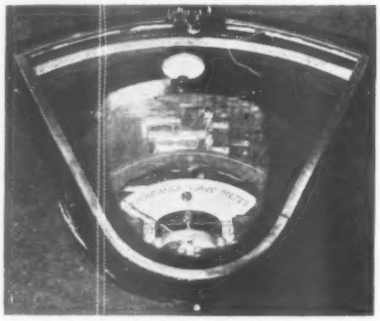
1. The Binaural Indicator, which gives the direction in which the plane is traveling;

2. A Divergence Wave-Meter, which gives the distance the airplane is located from its base of operations.

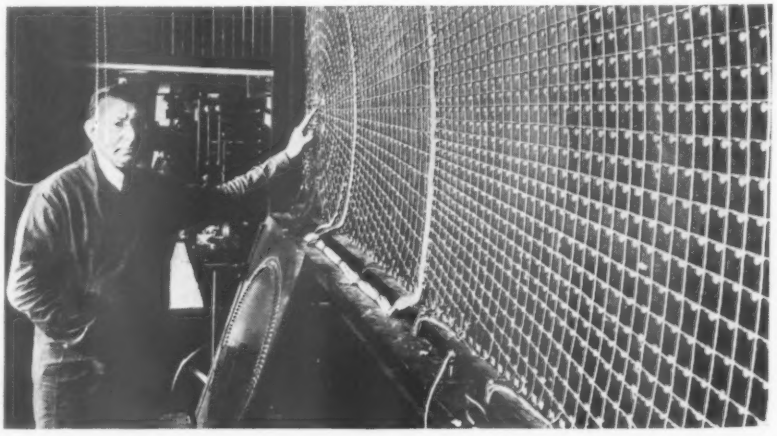
Thus, with the Spitz Flight Recorder, the dispatcher knows the exact location of the airplane at all times. In the event of deviation from the designated course, the dispatcher can immediately notify the pilot through the short-wave radio of the error of flight and direct him back to his course as well as give him the necessary information pertaining to the terrain over which he is flying, also the weather data, ceiling height, wind velocity on the ground and the ground conditions.

Suppose a plane left Los Angeles from the Union Terminal where the Spitz Flight Recorder would be located. The assumed trip will be to Kansas City.

In the instrument room at the terminal will be the dispatcher, watching



The Divergence Wave-meter which gives the distance and location of the plane from its base of operations.



Dr. Spitz at the rear of the Spitz flight indicator board, a very elaborate device by which trouble is indicated. The dispatcher knows the location of the plane at all times.

Reflects Plane's Position

THIS is a description of one of the most remarkable safety devices for scheduled plane operation that has yet come to our notice. By means of the instruments described, the dispatcher knows the location of a plane at all times and is instantly warned in case of trouble.

If the plane is down, the location is known so definitely that assistance can be sent directly to the spot without prolonged search as has been the case in the past.

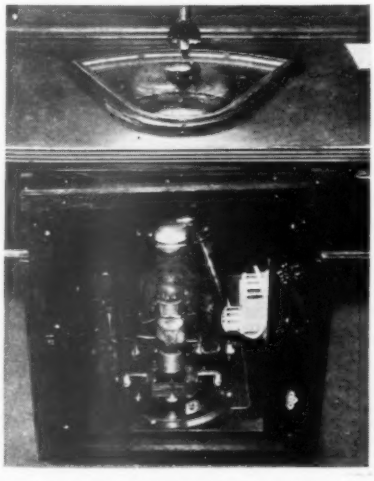
Front view of the Spitz Flight Recorder showing radio receiving instrument dials, and route map indicator. This is the operating side of the indicator board at the bottom of the opposite page.

Plane "A" as well as the other ships on different flights. The radio transmitter on Plane "A" would be sending back the propeller sounds while the flight proceeds across California, into Arizona and then into New Mexico.

Unknown to the ground crew, the pilot is fighting a leaking oil line. The engine is balking and spitting. Suddenly, somewhere over the wild terrain of Eastern New Mexico, the pilot is forced to land. By skillful handling of his ship, the pilot sets down in a narrow valley between two mountain ranges, washing out his landing gear but not seriously damaging his apparatus.

Back at Union Air Terminal, the dispatcher notices that the flight of Plane "A" has been signified by one light for some time. He watches more closely the Plane "A" route—the one light shining on the board. Soon he notifies the radio department that he is suspicious that something is wrong. The radio operator tries but cannot contact the pilot of Plane "A". There are no answers to his signals.

Quickly the base operators know that something is wrong. Within the hour help has started to Plane "A", a search that starts for a definite location, thanks to the Spitz Flight Recorder and not a search somewhere in Arizona or New Mexico or Western Kansas. The light board at the terminal attends to that. The days of searching for a plane in a hundred mile radius will be gone when this new method of checking flights is put into full operation as it surely will be within a few months.



Another view of the divergence wave-meter with actuating mechanism below.

It is also said that another use for the Spitz Flight Recorder will be in aiding ships in blind flying, the dispatcher being able to tell the pilot just how far he is from, for example, Los Angeles or San Francisco. An airplane leaving Los Angeles can be landed in San Francisco by the operator at the Los Angeles terminal, or vice versa, it is said, through a landing map.

In Naval and Military warfare this device can be used as the means of recording on a map the approach of the enemy planes several thousand miles distant, their flight being recorded either at the ground station or on board a naval vessel and relayed by means of a radio to land bases.

The question is asked, as well it might be, "But suppose there is more than one airplane in the air at once?" That is explained by Dr. Spitz in this way:

"Each operating company will be given control of their aircraft through the installation of the variable condensers in the Automatic Tuning Device, the number to depend on the total number of airplanes to be operated by each company."

Many notable men and women in the aviation world, as well as airline officials, have inspected the Spitz Flight Recorder at Union Air Terminal in Burbank, California, where the device is assembled and all without exception marvel at the possibilities of this remarkable invention.

It will mean greater safety, more assurance that those who go out will come back or, if adversity cross their path, that aid can be rushed to them. It will mean the end of such headlines:

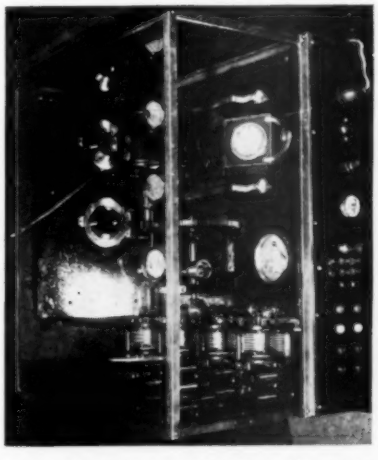
"Pilot Lost Somewhere in Mountains."

It is surely the Mirror of the Sky.

While this appliance does not in anyway prevent the plane from crashing, yet it does eliminate one of the most dangerous elements of a crash—the waiting by the crew and passengers for assistance. It speeds surgical aid when needed, saves valuable time in sub-zero weather when the passengers are suffering from the cold and in many ways expedites service.

That function of the instrument that enables the dispatcher to give instructions to the pilot as to the location of the plane, when flying blind, alone justifies the installation of this equipment—and all expense connected with it.

END.



Automatic tuner by which the radio waves are tuned into the plane at all times.

Design Theft to Stop

"WHILE legal stealing was carried on for any number of years, it was apprehended and stood up before the bar of justice to receive its due. It is high time that moral theft was also checked. This, my bill attempts."

So stated Congressman Thomas O'Malley of Milwaukee, Wisconsin, as he laid his bill on the desk of the speaker of the House of Representatives, Joseph T. Byrns, on May 16, 1935.

The bill, itself, reads, "Any person who is the original author of a design which is applied to a surface . . . which comprises the shape or form of a manufactured product . . . "

The above covers the field of flying machines, adding later on the words, "and all types of land, water and air vehicles and combinations thereof."

The Bill was referred to the Committee on Patents from where it will be checked carefully for its advantages and disadvantages. Failing to pass the committee on patents will render the bill void and null. If it is reported favorably, however, and goes up for a vote, debating follows, after which it is either passed or rejected.

As to whether or not it will pass, Mr. O'Malley stated on the day of the introduction of the bill, "If there is any conscience at all left in the hearts and minds of the members of Congress, they will pass this bill."

In the old days and even today, under the present patent laws, it is next to impossible to actually protect any design or machine unless it is absolutely a radical novelty. One little change may easily secure a patent on the same thing to all intents and purposes. That sort of thing, Congressman O'Malley seeks to stop once and for all.

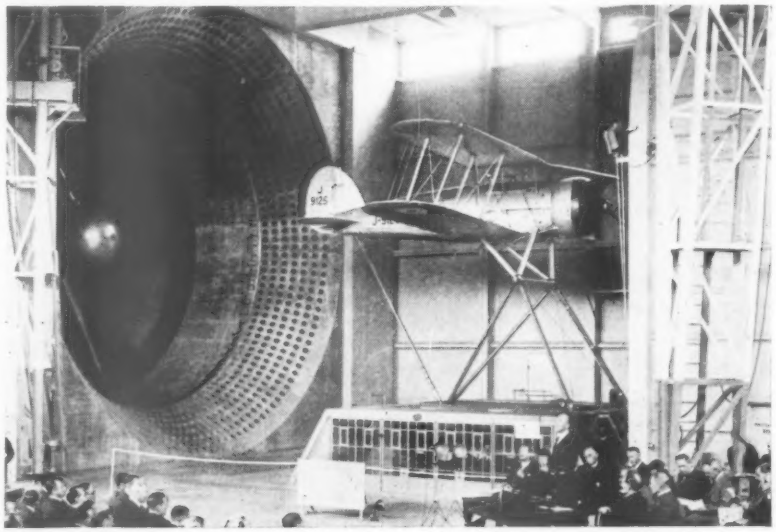
Cases of design piracy are well known to the aviation industry. In fact, the public, with Stinsons and Martins and Lockheeds looking so much alike to the unpractised eye, will often say, "That airplane has been overhead about twenty times now." As a matter of fact, every plane that went overhead is of a different type, patented under its own name and design, and still so slightly different that it looks almost exactly like its fellow planes.

Well, just how much good the bill will actually accomplish along these lines, if passed by the Senate and House, is a problem, but it is undoubtedly a move in the right direction.

It could be used to great an extent, as have some bills recently, or it might be cut down to nothing, rendering it of little or no value to the designer.

Patent Bills, in the past, have been particularly difficult to handle, due to the wide divergence of opinion of just what constitutes "newness." That question has raged in Patent Committees here as far back as any history records the growth of the United States. Just where it will land the "O'Malley Design Registration Act," only time can tell.

New Tunnel for Royal Aircraft Lab



The inauguration of the new British wind-tunnel at Farnsborough.

A HUGE wind-tunnel has just been completed for the British Royal Aircraft Establishment laboratory at Farnsborough, Hampshire, England. As shown above, it is capable of testing full size planes without the necessity for scale corrections, as is the case with model tunnels.

This tunnel has a 24-foot throat and can make tests at velocities over 200 m.p.h., covering practically all present flight conditions. It is particularly adapted for making stability tests.

At the time this picture was taken, the tunnel was undergoing the dedication ceremonies. The Marquess of Londonderry, Secretary of State for Air, is in the speaker's stand, making the presentation speech. This tunnel, in many respects, is similar to the full-scale tunnel operated by the government in this country for the past several years.

The Caterpillar Tractor Does Its Bit

POWERFUL when in the air, this Pan American Clipper ship was towed tamely up the landing ramp by a Diesel powered caterpillar tractor after its return from the Hawaiian trip.

Tractors have long been employed at commercial landing fields for handling large transport ships, but the employment of these useful machines at seabases is more or less of a novelty.

The caterpillar tractor pulling the flying-boat up the seaplane ramp.

The Eyes of the U. S. Army

by ROGER F. PARKHILL

In which an accurate description is given of the observation squadrons, their organization and purpose. The observation squadrons, while not so romantic as the pursuit squadrons fulfill a most useful service.

THE Air Corps, of the United States Army, is composed of two specialized branches — the Air Service, which includes only those military aircraft which operate with the ground forces; and the Air Force, which operates independently of the ground forces.

The Air Service—observation aviation—is the eye of the army and air forces, informing the army commanders of movements behind the enemy's lines, locating objectives for the attack and bombardment aviation and adjusting artillery fire.

The air force—pursuit, attack and bombardment aviation — receives the brunt of actual combat in the air. Its main purpose is to gain undisputed control of the air so that the observation aircraft can operate efficiently and in security.

The earliest military use of aircraft in the United States was for observation purposes. On July 1, 1907, the Wright Brothers delivered their first airplane to the War Department. Development as a branch of the Signal Corps was slow and by April, 1917, there were only fifty-five airplanes, unfit and obsolete, in actual service.

Europe had been considerably behind us in aircraft development until 1914, although Great Britain and France had organized an Air Corps in 1912 and Germany in 1913. Military airplanes in 1914 were underpowered, two and three-place ships intended only for observation and were of purely experimental types.

With the outbreak of the war, aircraft development accelerated until it had gathered unbelievable speed and had reached a high degree of efficiency. The last two years of the war were practically decided in the air. If German High Command had had a proper appreciation of the value of aviation in 1914, the First Battle of the Marne might have ended differently. The German General Staff ignored information furnished by an observation pilot and lost a chance to destroy the French Fifth Army and the British Expeditionary Forces on their left wing.

It is air observation that has changed the methods of ground warfare. Air observation has eliminated the meeting engagement of two hostile ground forces deployed for battle. Modern warfare has become a long distance duel with artillery and air force as the principal weapons, and with infantry holding the territory secured by these arms.

An army commander must be informed of events far behind the enemy's lines; a division commander, however, is interested only in conditions along his individual sector. Thus, we have the development of specialized branches of observation aviation—Army Observation and Corps Observation.

Army Observation planes are three place (pilot, observor, and radio operator), with two supercharged engines and possessing an endurance of from five to seven hours at full throttle. They perform distant daylight missions of Army, General Headquarters, Air Force, and Sea Coast Patrol. They must be able to fly at high altitudes at high speeds.

With slight modifications they can be used for night reconnaissance and light bombing. The types in general use are known as the Fokker (General Aviation) YO-27 and the Douglas O-35; both are equipped with the Curtiss Conqueror liquid-cooled engine and retractable landing gear. Army observation planes must possess the following qualifications:

1. High speed at altitudes above 15,000 feet.
2. Vision in every direction and protection of the observor from the slipstream.
3. High degree of stability for blind flying.
4. Minimum radius of action, 300 miles.
5. Either water, Prestone, air-cooled, or Diesel engines may be used.
6. Armament to consist of two thirty-caliber Browning machine guns mounted both front and rear on twin mounts. No offensive equipment, such as bombs, are to be used.
7. Camera carried in front cockpit.
8. Two-way radio telegraph set of intermediate frequency and 250 mile operating range.

Corps Observation planes are light, fast, single-engined aircraft, without supercharger, and with an endurance of from one to three hours at full throttle or from three to four hours at cruising speeds.

Standard types now in use are the Thomas-Morse O-19E and the Douglas O-38B equipped with the air-cooled Pratt and Whitney Hornet motor of 525 horsepower; and the Curtiss O-16 and the Douglas O-25C equipped with the Prestone-cooled Curtiss Conqueror motor of 600 horsepower. These ships are reliable but slow biplanes of obsolete design, and are now being replaced by more modern types, the majority of which are monoplanes.

Planes which have passed the experimental stage and are being supplied to the Air Corps are the Curtiss O-40B and the Douglas O-43A, both of which are high speed monoplanes of all-metal construction. These two ships embody all the principles of corps observation which have been learned during the last ten years. Corps Observation planes must possess the following qualifications:

1. High speed to enable plane to escape enemy pursuit.
2. Low flying speed necessary for careful observation.
3. High rate of climb to enable plane to take off from small advanced airdrome.

(*Concluded on page* 196)

Air Corps observation squadron representing four distinct developments of a single Douglas type, the BT-1, 0-38, 0-38-B, and 0-38-D. The 109th Aero Squadron, Minnesota National Guard.

Largest Aerial Camera

THE largest aerial camera ever built anywhere in the world is now under construction for the U. S. Coast and Geodetic Survey and will be used to complete the mapping of the United States.

The monster camera has nine lenses, weighs 300 pounds, and one exposure will cover an area that requires 20 exposures with the type of camera now in use. Each photograph will take in 250 square miles. The film used is 23 inches wide by 200 feet long, and will make 100 exposures.

It is expected that this new camera will greatly reduce the cost of mapping by aerial photography, and will also make possible stereoscopic mapping.

Caproni Celebrates Birthday

THE Caproni Works of Taliedo and Milan, Italy, always celebrate the anniversary of the first flight of a Caproni Plane with appropriate ceremonies.

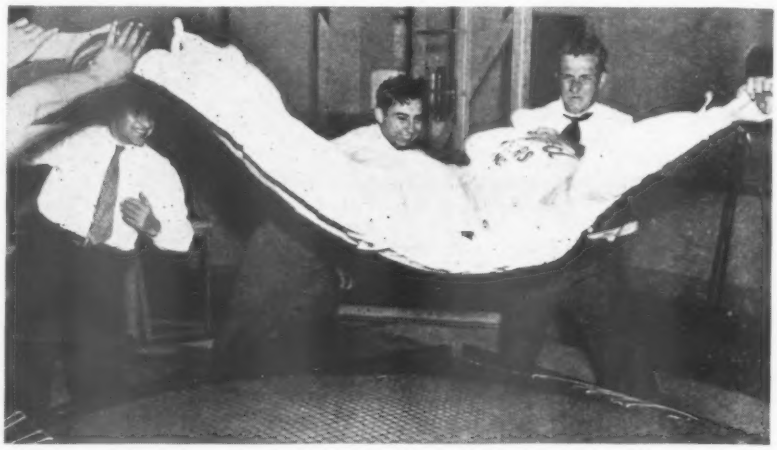
In the photograph attached, we see the Caproni No. 1, a biplane built in 1910. In the center picture is Gianni Caproni himself, the designer of the Caproni planes. He is standing by the side of the largest Italian bomber the Caproni 90 P.B., a six-engine job.

In the last picture is the most recent transport monoplane, the Caproni C.123 type that was inspired by the Douglas DC2. This ship has a cruising speed of 200 m.p.h. with a range of 900 miles.

The History of Caproni in three stages.

Floating Around in Akron's Breezes

by HELEN S. WATERHOUSE



Here's Babe Walker floating on a 90 m.p.h. zephyr coming out of the wind-tunnel mouth. It's hard to keep her from floating away.

WHIPPED and buffeted by a 95-mile-per-hour blast from the vent of a gigantic wind tunnel, the fragile body of Babe Smith Walker, Akron, Ohio, girl parachutist, was lifted six feet in the air recently in one of the most unusual scientific tests ever staged.

It was the first time a human model had ever been tested in a wind tunnel, Dr. Theodore Troller, resident director of the Guggenheim Airship Institute, declares. The wind tunnel of the Guggenheim Institute is the largest vertical tunnel in the world and previously has been used only for the testing of airship and airplane models. The experiment, proposed by Dr. Wolfgang Klemperer, aerologist at the Goodyear-Zeppelin company, was for two purposes.

"First, we want to be able to answer the question, how fast does a parachutist fall in various positions," said Dr. Klemperer. "Second, we wish to find in what positions a parachutist falls, how she moves in mid-air and what bends or crouches her body assumes when falling through space."

At the end of the fourth test, Dr. Troller announced that one thing had been ascertained by the test — that it takes a 90-mile-an-hour wind to carry the weight of a body weighing 118 pounds lying flat. Starting with a wind velocity of 70 miles an hour they had gradually speeded the wind almost to its limit of 125 miles an hour.

Overall-clad and helmeted and wearing goggles over her eyes and no shoes (because the force of the air might have carried the shoes into the tunnel), Babe stretched herself on the wide-meshed wire screening which was her sole support above the mammoth vent. A dozen scientists from the airship institute were gathered in a circle about her and one man stood waiting at the instrument board at the side of the room. As he turned on a lever and the distant roar of the wind was heard, like the thunder of an approaching train, the men leaned forward anxiously, their hair wildly blowing in the terrific breeze, to see what would happen.

As the speed of the wind increased, Babe's body slowly rose from the screening, feet first, at first only an inch or two, then several feet and finally, as the full blast of the current was turned on, reached the height of eight feet.

Her wrists had been bound with ropes which two of the men held and, as her slender form writhed and twisted and turned in the violent wind-stream, the men were obliged to push her from time to time when she was borne out of the stream and towards the edge of the vent. When the current was turned off, her body sank slowly to the screening. Her face was pale but she was game to try it over again, she said.

"I feel all right, I guess, only a little chilly. The sensation is almost the same as I get when I jump with a parachute and hit a head wind," she said.

In the second test, she stood on the side of the vent as if diving and her body was propelled face downward into the air. Then she tried to assume some of the positions she uses when jumping with a chute. She attempted to turn on her side in midair and used a swimming motion with her arms.

"Is it hard to stretch out your arms?" yelled Dr. Troller once above the thunderous noise. Babe nodded, unable to speak.

"This is the first time a wind-tunnel model ever has been able to show its reactions to tests," laughed Dr. Klemperer. He explained that previously tests have been made in Russian wind tunnels on race-horse models to determine the wind resistance caused by jockeys when sitting up straight and when bending low over the saddle.

"And at Goettingen, where there is a large horizontal wind tunnel, a model of a ski jumper in various poses was tried out. When it was found that the wind resistance in ski jumping was much lessened by using a crouching po-

(*Concluded on page* 196)

Bailing 'em Out of Transports

by E. VERNE STEWART

The author, an experienced parachute man, analyzes the use of parachutes and their necessity on scheduled airlines. He treats the matter from a highly original standpoint.

GO to any field where a transport plane is about to be loaded with passengers for a cross-country trip.

See how blandly they enter the ship, all showing that nonchalant air of the seasoned air traveler, even if they have never been off the ground before. Outwardly they look bored, but an injection of truth serum might make them tell their fears, one of which undoubtedly would be:

"I wonder if this will be my last ride?"

The person who doesn't think—or hasn't thought that, at the beginning of an airplane ride doesn't live.

Suppose some misguided official suddenly told the passengers, about to board the ship, that they would be required to wear a parachute on this and all future trips; that they would be shown how to use the 'chute and, if it became necessary to leave the ship in an emergency, the pilot would tell them when. How many would make the trip? Your guess is as good as mine.

Just the idea of leaving the aircraft in mid-air is appalling to the average person and, when flying for business or pleasure, the passenger wants nothing around him that even suggests that any danger is connected with the flight. No matter what a person does, whether it is walking across a busy street, changing places in a canoe, or driving a fast car, the association of danger with the undertaking is very small. The general idea is: "It won't happen to me."

If the passengers did take the trip and did wear the parachutes, their line of thought would prevent any pleasure in the trip, or offset anything that an otherwise efficient and charming stewardess might offer in the way of conversation or luncheon. The seats nearest the door would be clamored for, and the ship would suddenly seem small and cramped. At even a suggestion of an emergency, the ship would become a madhouse full of silk covered people. Rip cords would be pulled and thrown all over the place.

Thus, the idea of equipping passengers on a large transport ship with individual manually operated parachutes, is something that approaches the ridiculous and no intelligent person would think that such a thing will come to pass. The greatest shortcoming of the idea is lack of coolness and clear thinking in an emergency,—the speed with which accidents happen and the inability of the untrained person to act quickly and surely in the right direction.

Mr. and Mrs. John Public are queer people, more like children than the children themselves. We don't expect children to know where danger exists so we tell them, and by a great many other ways they are educated. Mr. and Mrs. J. P. are educated, too,—in some things—insurance, for instance.

While this is a parachute event in the R. A. F. Air Pageant, yet it clearly illustrates one method of disposing of passengers in a hurry from a disabled plane. Whether they are to be dropped out of the bottom of the plane against their wishes or merely jump is another matter.

They know that insurance reduces risks and pays for unavoidable losses. They know that fire insurance is the great preventive of fire. That workmen's compensation headed the safety movement in American industry. That marine insurance compels safety in ship building and that life insurance stimulates improvement of public health. They know that the greatest gain in any insurance is found in accidents, fires, and deaths prevented.

Yet they blithely and blindly let transport companies decide for them when it comes to safety in the air.

Suppose that our school boards decided that sprinkler systems and fire escapes were just adding to the expense of maintenance, and as they were hardly ever used, should not be included in future design? Suppose that hotels, office and factory buildings followed the same line of thought and practiced it in future buildings?

Suppose that marine companies decided to discard life-boats, belts, and other numerous adjuncts to safety on an ocean liner, and said that the fact that ocean travel by steamer had progressed so far that these means of safety were not needed? What would be the general reaction? The greatest howl in the history of the universe would be the result.

And that is just what is happening today where flying is concerned.

The airplane of today has exceeded even the wildest dreams of a decade and a half ago. Speeds that rival the velocity of a bullet—appointments that compare with a modern Pullman car.

Every convenience is there for the passenger's comfort. He can get a meal, take a bath or go to bed if he so desires—but not a thing is in sight that even slightly suggests life saving equipment. His childlike faith is placed implicitly in the ability of the pilot to carry him the only way he cares to think about being carried—safely.

With all the modern improvements that can be crowded into one plane, with all its safety devices, it still remains a heavier-than-air machine and if it does fail, structurally, despite the greatest precautions taken beforehand, no earthly power can keep it in the air until a safe landing can be effected.

Getting back to the subject of having passengers jump—this is not necessary and here is a reason why. In the case of a forced landing the passenger depends upon the skill of the pilot to bring the plane down safely—if he can.

The same passenger depends on the same pilot's knowledge to know whether it is safe to continue flying when the weather closes in on them. True

enough, they may have two-way radio contact with base fields and know their location exactly, at all times. Blind flying is common to the extent of taking off and landing without ever seeing the ground, BUT—and this situation is not impossible

IF the radio failed, with very little chance of fixing it; a peasoup fog right down to the ground and only an hour's gasoline supply left, the only alternative left to the pilot if his ship wasn't equipped with some means of escape or safety for his passengers, would be to fly until the gas supply gave out and trust that he might find a hole in the fog so he could land. The chances are a thousand to one against him that he could land safely.

Now, another "but"—if the ship were equipped with some means of emergency escape, it would probably mean only the pull of a lever and the passengers would be on their way to safety. This is not just a Utopian dream, but an actual proved fact. Several methods have been devised and have been given many tests, some with living people under simulated distress conditions.

Floyd Smith designed a parachute that looks like a big upholstered easy chair and is just as comfortable to sit in as the chairs now in use in the latest transport ships. When there is an emergency, the pilot pulls a lever that releases the upholstering and two snaps come into view. This is the signal for the passenger to fasten the snaps exposed, the method of which is so obviously simple that one couldn't go wrong.

A second lever and the passenger, seat and all, drop through a trap door in the bottom of the plane. A static line attached to the hidden parachute and the ship, unfolds and rips the parachute open safely away from the ship. A ship with twenty passengers can be unloaded in as little a space of time as twelve seconds!

The crew can then leave in their manually operated quick attachable parachutes.

The fog situation is not the only one in which parachutes are necessary. A failure of a propeller may tear a wing loose, or so seriously affect the control of the ship that it could become unmanageable. The loss of an aileron or tail group (and this has happened) would be decidedly embarassing and I don't know of anyone who would care to be in a ship without escape methods if a fire broke out.

Many other methods have been devised that have much merit and among them is one that the late "Spud" Manning and Frank Austain tried out successfully many times. In this arrangement the passengers were ejected sideways from the ship in a chair and then dropped from an arm, a static line operating the 'chutes. Former Master Sergeant Erwin H. Nichols, with Jasper A. Gilliam, developed a device on the principle that passengers should not be depended upon to pull their own rip-

(*Concluded on page* 196)

The Aero-Sportswoman
by JOAN THOMAS

LAST summer we told you that one of our dreams was to be a "roving reporter." The extent of our wanderings then, was to do a bit of scouting in the Colorado Rockies, trying to imagine what the South American Andes might be like by flying over Pike's Peak in an Eaglerock. And later we had the fun of exploring Kentucky and the Carolinas with the "flying Pattersons."

However, this year thanks to the stars that rule our course, our compass pointed eastward. We traveled via the American Airlines to New York, and then since trans-Atlantic flying is still the path of the pioneers and not in the ken of mere roving reporters, we had to condescend to a wave-bound ship of the sea.

On that first leg of the journey, cruising along 10,000 feet over the Allegheny Mountains at 225 m.p.h. in one of Mr. Douglas' super-airliners, we watched shafts of sunlight pierce the gloom beneath the clouds—like giant searchlights picking out the valleys and gliding the ridges of the hills—and tried to visualize what aviation would have to offer the trippers in another ten years. It is still an amazing experience to have lunch in Chicago and to dine in New York a few hours later. But when the dreams of the flying fraternity are realized and the stratosphere is conquered; when that 10,000 foot altitude is ten miles and the 225 m.p.h. becomes 600 or more, perhaps we will dine in Paris or Moscow instead of New York!

The American Airlines' policy of inviting their passengers to inspect the forward part of the ship during the flight; to watch the pilots at the controls and to see something of the fascinating array of instruments in the cockpit, we think is a smart idea. The most blasé traveler cannot help being impressed with the intricate mechanism. And it must inspire confidence as well as admiration, for the skill and knowledge of the men who are intrusted with the maintenance and control of such a machine.

In New York we had the pleasure of lunching with Ruth Nichols and of visiting the office of our esteemed colleagues, Clara Studer and Fay Gillis. They fed us tea and cookies and told us all about the inner workings of *Airwoman*. We know how much you like that fine little sheet, but we don't think you half appreciate the great handicaps that the girls are working under. They deserve a lot of credit and a heap more co-operation than they are getting.

Everyone *tells* them what a grand job they are doing but fail to offer any explanation about how a magazine can be run without the proper financial backing. If every 99er and member of the WNAA would get out and sell five subscriptions and even one advertisement,

Miss Mary Hilsz who recently broke the women's world altitude record in France. She is shown here, adjusting her goggles before the take-off.

many of their problems would be solved. Or if some aviation enthusiast could be induced to see the value of contributing a small endowment fund to the organization, it would mean far more to the women flyers than a dozen prizes and as many gilded trophies for some local air-meet.

We feel very keenly on the subject and regret that the summer plans are taking us too far afield to do as much as we would like about it. That is, unless our French improves enough so that we can start a chapter of the 99 in Paris and then translate the magazine into the patois of the Boulevards.

The first person we met in Paris, who is interested in flying, was Madame Paul Linké—formerly Hannah Kirman of Cincinnati, Ohio. Hannah has been living here for the past four years and although she hasn't kept up her flying, she is just as enthusiastic as ever. We have had some grand times reviewing the events of four or five years ago. She flew in the National Air Races in Chicago in 1930. And she is insatiable for the latest news of the *who* and *what* of present day flying and fliers.

Hannah has offered to help us interview the local women pilots and to investigate the latest developments of French aviation. This is a grand bit of luck for us, because our knowledge of the language might not be sufficient for the technical details.

We had a most amusing time last Saturday making a preliminary survey of the airports around Paris, with a pilot who did not speak English. It was a hilarious afternoon trying to find the right word for the various maneuvers and different parts of the plane. In the time honored custom of "acting out", with many gestures, anything you can't explain, we found looping, wing-overs

(*Concluded on page* 186)

P. A.'s Aviation Directory

This is the third and last installment of aeronautical addresses, classified according to the nature of the merchandise manufactured or sold. Names in bold face type are firms who have produced in the past year.

ENGINES (CONTINUED)

Martin Motors Co., Glenn L., Baltimore, Md.

Menasco Manufacturing Company, 6714 McKinley Ave., Los Angeles, Calif. Makers of Menasco engines.

Michigan Aero-Engine Corp., South Hosmer St., Lansing, Mich.

Milwaukee Parts Corp., 6075 Sixth St., Milwaukee, Wis.

National Airplane and Motor Co., Billings, Mont. Makers of the National Lightplane engine.

Packard Motor Car Co., E. Grand Blvd. & Belt Line, Detroit, Mich. Formerly makers of the Packard Aircraft engines and the Packard Diesel Aircraft engine.

Pietenpol, B. H., Spring Valley, Minn. Ford conversions.

Poyer Aircraft Engine Company, Fairfax Airport, Kansas City, Kans. Makers of the Poyer lightplane engine.

Pratt & Whitney Aircraft Co., East Hartford, Conn. Makers of the P & W Wasp and Hornet engines.

Precision Mechanical Works, 1508 Douglas St., Wichita, Kans.

Ranger Engineering Corporation, Farmingdale, N. Y. Makers of the Ranger V-770-B, V-770-SB, 6-390 and 6-390-B engines.

Rose Aeroplane Company, 4439 N. Clark St., Chicago, Ill.

Steel Products Engineering Co., Dakota Ave. and Columbia St., Springfield, Ohio.

Straughan Aircraft Corp., 628 S. Grove St., Wichita, Kans. Ford engine conversions for lightplanes.

Superior Machine Tool Co., Kokomo, Ind.

Szekely Aircraft & Engine Co., Holland, Mich. See Aviation Holding Company, Holland, Mich.

Uppercu Corporation, Keyport, N. J.

Warner Aircraft Corporation, 20263 West Hoover Ave., Detroit, Mich. Scarab, Scarab Junior and Super Scarab, engines.

Welch Aircraft Motors, Anderson, Ind. Makers of the Welch 0-2 engine, for lightplanes.

Wright Aeronautical Corporation, Paterson, N. J. Makers of the Cyclone, Whirlwind, Curtiss Conqueror engines.

ENGINE PARTS AND ACCESSORIES

Air-Parts Company, Glendale, Calif. New and reconditioned engine parts and replacements.

Aircraft Salvage and Supply Co., Hangar 32, Roosevelt Field, Mineola, N. Y. New and used engine parts bought and sold.

Airplane Parts and Supplies, Inc., 1416 N. Fernando Road, Glendale, Calif. New and used engine parts and complete engines. Supplies and accessories.

Ambrose (Frank), Inc., Municipal Airport No. 2, Jackson Heights, N. Y. Parts for aviation engines, accessories, etc.

Detroit Aero-Motors Co., Highland Park, Mich., engine parts.

Engine Brokers, Hangar B., Roosevelt Field, Mineola, N. Y.

Hibbs, Fort Worth, Texas. New and used engines and engine parts.

Logan Aviation Co., 716 Superior St., Cleveland, Ohio. New parts for engines and accessories, OX-5, OXX-6, Hispano, Liberty, etc. Accessories and supplies.

Northrop (Marvin A.) Aeroplane Co., Minneapolis, Minn. New and used engines and engine parts, wartime engine souvenirs.

Ort, Karl, 608-640 W. Poplar St., York, Pa. New and used engines, engine parts, accessories and supplies.

Pacific Airmotive Corp., Ltd., Airplane engines and parts. Located at Union Air Terminal, Burbank, Calif., and San Francisco Airport, San Francisco, Calif.

Universal Aircraft Co., Fort Worth, Texas. New and used engines, engine parts and accessories.

FABRIC COVERING

(See Accessory & Supply Dealers)

Suncook Mills, 34 Thomas St., New York, N. Y. Makers of Flightex fabric.

FITTINGS—HARDWARE

Aerial Machine and Tool Corp., 260 West St., New York, N. Y.

Aero Supply Mfg. Corp., Corry, Pa.

Cleveland Pneumatic Tool Co., The, 3734 E. 74th St., Cleveland, Ohio.

Dayton Mfg. Co., Dayton, Ohio.

Husband Aircraft Specialties, 6545 Carnegie Ave., Cleveland, Ohio.

National Steel Products, Dayton, Ohio.

John A. Roebling's Sons Company, Trenton, N. J.

Steel Products Engineering Co., Springfield, Ohio.

Weatherhead Company, 632 Frankfort Ave., Cleveland, Ohio.

FITTINGS (OIL AND FUEL LINE)

American Brass Company, Waterbury, Conn.

Husband Aircraft Specialties, 6545 Carnegie Ave., Cleveland, Ohio.

Lunkenheimer Co., Cincinnati, Ohio.

Parker Appliance Co., 10320 Berea Rd., Cleveland, Ohio.

Titeflex Metal Hose Co., Frelinghuysen Ave., Newark, N. J.

United Aircraft Products, Inc., Dayton, Ohio.

FLARES (SIGNAL AND BORDER)

International Flare Signal Co., Tippecanoe City, Ohio.

J. C. Newman & Co., Inc., 2 E. 45th St., New York, N. Y.

FLOATS—PONTOONS—SKIIS

S. J. Baum, 49 Mill St., Astoria, L. I., N. Y.

Brewster Aeronautical Corp., Brewster Bldg., Long Island City, L. I.

Edo Aircraft Corp., College Point, Long Island, N. Y.

Federal Aircraft Works, 69 S. 13th St., Minneapolis, Minn.

Fleetwings, Inc., Bristol, Pa.

Warner (The) Aircraft Corp., 20263 Hoover Ave., Detroit, Mich.

IGNITION—MAGNETOS—FITTINGS

A. C. Spark Plug Co., Flint, Mich.

American Wire & Steel Co., 208 S. La Salle St., Chicago. Ignition cable.

Berling Magneto Co., Buffalo, N. Y. Berling magnetos.

B. G. Corporation, The, 136 W. 52nd St., New York, N. Y. Spark plugs.

Champion Spark Plug Co., Toledo, Ohio.

Eclipse Aviation, E. Orange, N. J. Ignition switches, starters, etc.

Edison-Splitdorf Co., East Orange, N. J. Spark plugs.

Electric Storage Battery Co., The, Allegheny Ave., at 19th St., Philadelphia, Pa.

Mosler Ignition Corp., 345 Hudson St., New York, N. Y. Spark plugs.

Ort, Karl, Polar St., York, Pa.

Packard Electric Corp., Warren, Ohio. Ignition cable.

Scintilla Magneto Co., Sydney, N. Y. Scintilla magnetos, battery ignition systems and ignition switches.

United-American Bosch Corp., Springfield, Mass. Magnetos.

INSTRUMENT MANUFACTURERS

Aerial Machine and Tool Corp., 260 West St., New York, N. Y.

Aero Instrument Co., 3678 W. 138th St., Cleveland, Ohio.

Aeromarine Instrument Co., Inc., 370 Gerard Ave., New York, N. Y. Complete line of aircraft instruments and shock-proof panel assemblies. Gauges and meters.

American Paulin System, Maple Ave., Los Angeles, Calif.

Barbour-Stockwell Co., 205 Broadway, Cambridge, Mass.

Central Scientific Co., Chicago, Ill. Laboratory, meteorological instruments.

Consolidated - Ashcroft - Hancock Co., Bridgeport, Conn. Gauges.

Elgin National Watch Co., Elgin, Ill. Aircraft instruments of all sorts, clocks, altimeters, tachometers, etc.

Foxboro Co., Foxboro, Mass. Aircraft instruments, recording instruments, process instruments, thermometers, etc.

Frisbie Aircraft Products, 161 Edgewood Ave., New Haven, Conn.

General Electric Company, Schenectady, N. Y. Complete line of aircraft and electrical instruments, tachometers, etc.

Jaeger Watch Company, 304 E. 45th St., New York, N. Y.

Kenyon Instrument Co., 364 E. 1st St., South Boston, Mass.

Kollsman Instrument Co., Inc., 1 Junius St., Brooklyn, N. Y. Complete line of aircraft instruments, altimeters, compasses, gauges, thermometers, etc.

Leeds & Northrop Company, 4901 Stenton Ave., Philadelphia, Pa. Aircraft instruments, laboratory instruments, scientific instruments, etc.

The Lewis Engineering Co., Naugatuck, Conn.

Motometer Gauge & Instrument Corp., La Crosse, Wis. Radiator and remote control water and oil thermometers.

New Haven Clock Co., New Haven, Conn.

Pioneer Instrument Company, 754 Lexington Ave., Brooklyn, N. Y. Com-

plete line of aircraft instruments, altimeters, tachometers, air-speed meters, etc.
Rieker Instrument Co., Fairmount Ave., Philadelphia, Pa.
E. S. Ritchie & Sons, 112 Cypress St., Brookline, Mass.
Shore Instrument & Mfg. Co., Van Wyck Ave., Jamaica, N. Y.
Sperry Gyroscope Company, Manhattan Bridge Place, Brooklyn, N. Y. Makers of gyro controlled aircraft instruments, Directional gyro, gyro-horizon, gyropilot, etc.
Star Compass Company, E. Milton, Mass.
Taylor Instrument Company, Rochester, N. Y.. Altimeters, barometers, psychrometric instruments, thermometers, recording instruments, laboratory instruments, process control, etc.
Waltham Clock Company, Waltham, Mass.
Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. Complete line of aircraft, electrical and industrial instruments.
Weston Electrical Instrument Company, Newark, N. J. A complete line of aircraft and electrical instruments, blind-landing indicators, tachometers, voltmeters, ammeters, etc.

INSTRUMENT DEALERS

(See Accessory and Supply Dealers)

PARACHUTE MANUFACTURERS

Irving Air Chute Company, 1670 Jefferson Ave., Buffalo, N. Y. Makers of the Irvin parachute.
Switlik Parachute and Equipment Co., Broad and Dye Sts., Trenton, N. J. Makers of the Switlik chute.
Triangle Parachute Company, 4917 Carthage Ave., Cincinnati, Ohio. Makers of the Triangle chute.

PARACHUTE DEALERS AND PACKERS

Thompson Brothers, Aurora, Ill. Parachutes repaired and packed, rented, bought and sold, exhibitions, etc.
Verne Stewart, Curtiss-Reynolds Airport, Glenview, Ill. Parachutes repaired and packed, exhibitions, etc.

PROPELLERS

Burnelli Aircraft, Keyport, N. J.
California Propeller Co., Ltd., W. Slauson Ave., Los Angeles, Calif.
Eclipse Aviation Corp., East Orange, N. J. Propeller hubs.
Flottorp Propeller Co., Linden Ave., Grand Rapids, Mich.
Gardner Propeller Company, Circle Ave., Forest Park, Ill.
Hamilton Standard Propeller Co., East Hartford, Conn. Hamilton metal and variable-pitch propellers.
Hartzell Propeller Co., Piqua, Ohio.
Hibbs, Fort Worth, Texas. Lightplane, sled and boat propellers.
Lorenzen Propeller Company, Niles, Mich. Lightplane, special propellers.
Lycoming-Smith Manfg. Company, Williamsport, Pa. Smith metal variable pitch propellers.
Marshall-Fahlin Propeller Co., Marshall, Mo.
Ort, Karl, 608-640 W. Poplar St., York, Pa. Dealer.
Sensenich Brothers, Lititz, Pa.
Stone Propeller Company, Wichita, Kans.
Story, Gawley Co., San Fernando Rd., Glendale, Calif.
Supreme Propeller Co., Wichita, Kans.
Universal Aircraft Co., Fort Worth, Texas. Lightplane, sled and boat propellers.

(*Concluded on page* 187)

Potez Airliners for the Air France

The Potez "62" Airliner built for Air France.

AIR FRANCE, the great French air line company, has just ordered fourteen new Potez "62" transport monoplanes. The Potez "62" is equipped with two Gnome-Rhone 14-cylinder engines, one engine of which can fly the plane satisfactorily.

It is said to possess remarkable gliding qualities and is unusually easy to handle. This has been verified in the course of its regulation 100-hours of trial on the Paris-Lyon-Marseilles route. It can be landed in an exceptionally small space.

At 6,600 feet altitude it develops a maximum speed of 200 m.p.h. with both engines and 125 m.p.h. with only one engine functioning. The absolute ceiling with two engines is 28,500 feet. Cruising range with normal fuel supply is 685 miles at a speed of 175 m.p.h.

It is provided with seats for sixteen passengers and one bar-tender and when fully loaded with passengers, fuel and equipment, weighs about 14,000 pounds. The wing span is 74'-6" with a total wing area of 805 square feet. The total length is 57'-8".

DeHavilland Four-Engine Airliner

THE DeHavilland Aircraft Company has delivered the first four-engine "Express" airliner to the Quantas Empire Airways, Ltd., of Australia. The engines are the Gipsy 200 h.p. 6-cylinder in-line type, similar to those that propelled the "Comet" in the Australian Race of 1934.

The "Express" has a top speed, at 1,000 feet, of 173 m.p.h. and a cruising speed of 147 m.p.h. It climbs to 5,000 feet in 6-minutes and to 10,000 feet in 14-minutes. The service ceiling is 17,100 feet, on three engines only. The range is 472 miles.

Cabin layouts have been prepared for eight, ten or twelve passengers, depending upon conditions, with luggage and mail compartments in the rear. By decreasing the baggage space further than above, 14-comfortable chairs can be installed in the passenger cabin.

The wing span is 64'-6" and the length 46'-1". The empty weight is 5,935 pounds, exclusive of equipment, while the disposable load is rated at 4,065 pounds. Dual control is fitted with pilot and co-pilot side by side at a point where the visual range is particularly good.

The DeHavilland Four Engined Airliner "Express".

Radio for Gliders

FEATHER-WEIGHT radio sets will be used on gliders attempting to set endurance records this year. Small sending and receiving outfits weighing only four or five pounds have been developed, and these will make it possible for contestants to communicate with ground observers.

Meteorological information can be given the flyers, which may result in some new records being hung up. They can be told when storms are approaching and how best to avoid such areas. Tips can be sent them on where to find favorable currents and the best soaring conditions. While it is important to cut down every ounce of weight in a glider, it is believed that the few additional pounds will be more than compensated for by the valuable information received by the pilots.

At Elmira, New York, site of the National Soaring Contest each year, a permanent station has been set up and another station located in one of the cars used in tow-launching. Signals between glider and ground can be heard up to 30 miles. In the air, the range between gliders is 15 miles.

Device for Air Racing

A DEVICE that makes it possible for racing airplanes to turn pylons two miles or more in the air got its first demonstration during W. D. Tomlinson's recent flight in a Douglas transport which set eight world records.

Tomlinson was flying a triangular course between New York, Washington, and Norfolk. At Washington, the new device was set up on top of the operations office at Bolling Field which was the pylon at that point. It consisted of several theodolites, which are a sort of surveyor's transit.

Tomlinson, flying at over 11,000 feet was invisible to observers on the ground and it would of course have been impossible for them to have told whether or not he was cutting the pylon. However, as he neared Bolling on each trip around the 621-mile course, he radioed to the observers and the theodolytes were trained upward until they picked up his plane.

It was possible to tell with great accuracy just what point on the ground he was passing over. The angle of his course, his altitude, and his time could also be computed.

So accurate was the system, that the official timers in New York, Norfolk, and Washington, agreed at all times within four-tenths of a second.

Old Feature Restored

AFTER a lapse of several issues, the well liked column, "What Our Readers Are Building" will be permanently restored. The many letters received from our readers requesting this feature indicate that there are still a very great many people interested in what the other fellow is building. We were very much surprised and greatly pleased with this response and commendation by our readers.

A Swell Little Canadian Plane

Here she stands, a Corben-Salmson monoplane constructed in Canada by Jim Duddle, Ernest Buffum and Eldon Seymore. And we mustn't forget Santa Claus—Mr. John Taylor.

HERE'S something new from Canada, a homebuilt two-place Corben that looks like a factory job!

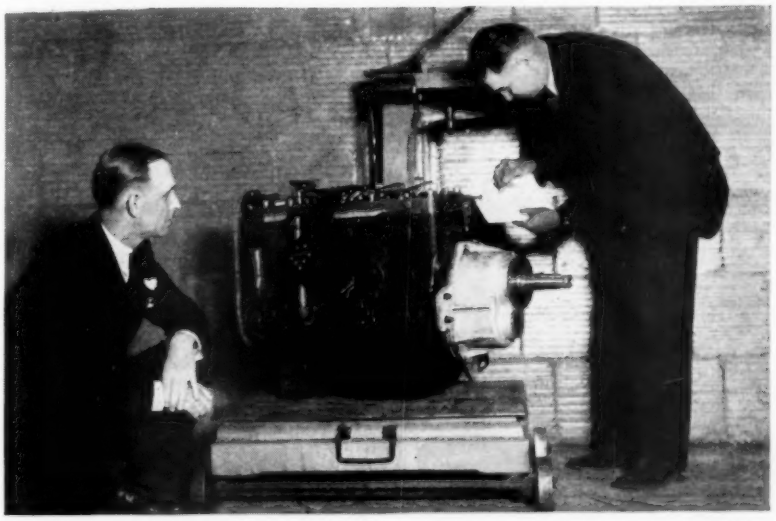
This little ship, powered by a French Salmson AD9 engine of 40 h.p., has just been completed by three young fellows of Vernon, B. C., Jim Duddle, Ernest Buffum and Eldon Seymour. Mr. John Taylor, an air-minded business man of the same city, (Santa Claus to you) was the financial backer. Although the actual construction was completed in about a year, delays in waiting for engine parts from France and England postponed the test flights for nearly another year.

Test flown by Lowell Dunsmore, well known Western Canada pilot, the plane showed a very fine performance. With one passenger the top speed was 85 m.p.h., cruising 75 and landing 33 m.p.h. The rate of climb was 700 feet for the first minute.

Like all good Corbens this machine has no tendency to fall off and spin when stalled and will maintain level flight hands off at 37 m.p.h.

The aircraft inspector and the test pilot both commented on the excellent workmanship. The ship is finished in red and silver with a spot-milled speed ring to add to its snappy appearance. The boys plan to fit her up with wheel pants in the near future.

Testing Converted Plymouth Motors



Melvin Perrin, inspector, (at left) watching the results of the weighing-in after the completion of the Plymouth tests. Harry E. Heath, sales-manager of the Amplex Division, Chrysler Motors, is taking down the weight—398 pounds.

OFFICIALS of Chrysler Motors are taking a great interest in the adaption of the Plymouth engine to light-plane propulsion. Recently, the converted Plymouth engine successfully passed the 50-hour running test demanded by the Bureau of Air Commerce, and the picture above shows the weigh-in after the test. The story of the Plymo-Coupe was given in our last issue.

The photo shows clearly (at right) the propeller reduction gear that is used with the Plymouth engine to gain more economical and effective engine and propeller speeds.

Smellography

HERE'S a story from Canada's north country which is unique to say the least. It deals with a new system of aerial searching which might be termed "aerial smellography", or sumpin'.

Two prospectors were lost since June 17th in the bush country of Northern Quebec. Searchers were beginning to lose hope until on June 28th an Indian guide flying in the district with "Duke" Schiller, famed north pilot, smelled wood smoke.

On circling the small lake just below them the searchers spotted a white flag, and made a landing. Sure enough there were the lost gold seekers, exhausted but alive. Thanks to the airplane combined with the traditionally good "smeller" of the Indian the two men are now in hospital and progressing very well.

This is a new idea in aerial navigation which would be well to call to the attention of the Bureau of Air Commerce. By arranging a variety of powerful odors in different localities, such as limburger cheese, fried onions or sauer-kraut, it would be possible to determine one's whereabouts with ease in the deepest pea-soup fog.

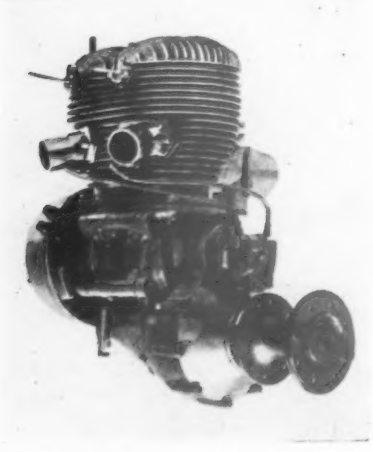
Aubier-Dunne Lightplane Engine

A NEW lightplane engine of 20 h.p. has just been produced by French manufacturers — The Aubier-Dunne Company.

This engine has a bore of 3 inches, a stroke of 3 inches and a cylinder capacity of 216 cubic inches. The total weight is 85 pounds. Specially constructed for lightplanes, it produces 20 h.p. at 4.000 r.p.m. reduced to 1.600 r.p.m. at the screw by a pinion.

The two cylinders are aluminum with steel jackets. The fuel consumption is 400 grams per hour per horsepowerhour, with a 4 percent oil mixture.

A great number of Aubier-Dunne 20 h.p. engines are now being ordered by French private owners for installation on their lightplanes.



The new French lightplane engine.

Frakes to Start Aviation School

Meet Mr. F. F. Frakes, the Dixie Dare-Devil, face-to-face.

F. F. FRAKES, the "Dixie Dare-Devil" of Columbia, Tenn., is known all over the United States as a plane-crasher and stunt man. His favorite amusement is to take an old ship up to about 2,000 feet, point her nose straight down and ride her until she crashes. He has performed this feat seventeen times with no serious injury to himself, in fact, he has been at it steadily since 1931.

His last intentional crash—attended with unintentional results—was in a Fox News Reel thriller on July Fourth. Something happened to the rudder leads so that he lost control and the ship went whirling to earth in a flat spin with Frakes still pulling back on the stick. That a man should come out of such a crash alive and be able to walk is a miracle—but he did. This incident determined him to quit crash stunting at the termination of his present contract and to enter into other less hazardous branches of aviation.

In short, Mr. Frakes is about to start a unique aviation school in which his extended experience will be of great value to the students. This will be a safe and sane flying course in which the past crashes experienced by Mr. Frakes will be of inestimable value to the boys. His great mastery over the controls of an airplane and his skill in bringing a ship out of all possible predicaments will be given as first-hand information to the students.

As one of the first and paramount ideas in starting this school, Mr. Frakes has studied out a means of greatly decreasing the cost of instruction. The student pays in ten dollars per month, on the club plan until a total of 100 dollars is paid in. A club with a plane will be started at any point in the United States where a group of 20 boys can be formed.

It should be borne in mind, however, that the proposed school is for teaching straight sane flying and is not a stunt or acrobatic school in any sense.

Diagnosing Motor Diseases

THIS diagnosing device does for the mechanic and engineer what the stethoscope does for the doctor.

In the case of internal combustion engines it is not such an easy matter to locate trouble because the stethoscope enables the doctor to take note of the audible movements of the air, while the outside "skin" of a machine consists of metal and the acoustic effect of the noises inside are detected by molecular vibrations in a longitudinal and less in a transverse direction, which are far more difficult to convey to the ear.

The apparatus seen here, makes it possible to transmit such noises so that they can be detected and corresponding conclusions as to the state of the machine or engine arrived at.

The inventor of this apparatus has designed his apparatus on the principle that steel is a very good conductor of sound. He accordingly employs a steel rod to convey the sound from the cover of the machine to a place easily accessible to the ear. The longitudinal vibrations that are so difficult to catch are changed over onto transverse vibrations by a membrane producing waves of air that are easily heard.

Such is the principle of this apparatus which transmits noises to the ear in undiminished intensity. The advantages of this are obvious; for it is possible to control the condition of machinery at all times, and to note any incipient breakdowns. This means that due precautions can be taken to avoid serious damage and extensive repairs.

Such an apparatus is equally useful for the owner of airplanes, more especially when on flights where suitable repair shops are not to be found. By listening to the engine after every run, it is possible to discover defects that may have developed in the meantime.

Using the Knock-detector for determining knocks.

Gasoline Models at St. Louis

by C. F. BRISTOL

A description of the highly interesting gasoline model airplane contest held recently in St. Louis, Mo. The winner registered a duration of over one hour.

A STAGGERING array of gas-powered model planes literally "stole the show" at Lambert Field, St. Louis, during the N.A.A. meet June 27-29.

Ranging all the way from three to ten feet in wing span and embodying a similar variety of style and structure, these "gas jobs" offer a many-sided problem to the student of model aircraft design, especially if he contemplates the construction of a miniature gas-powered ship.

The effectiveness of intelligent application in scale model design was demonstrated by Hubert Lacey, 21, of Dayton, O., who carried off first place in the "open" contest with his Buhl "Bull Pup."

Another example of the successful gas-powered scale model was the Corben Super Ace, built and flown by Winford Davis of Kansas City, Mo. Details of the Corben Super Ace, full size, appeared in POPULAR AVIATION for March, 1935.

Aeronca design is also popular with scale builders, a fine example being the model by Albert W. Courtial, Jr., of St. Louis. Scale models, being necessarily of the fixed wing type, depend upon shifting of the batteries to obtain flying balance.

All records at this time are held by disciples of the moveable wing theory, wherein the wing of the model is bound onto the fuselage with rubber string and may be shifted backward or forward to bring about the necessary balance. Maxwell B. Bassett, veteran "gas job" builder of Philadelphia and holder of the long distance flight record, employs this style of construction in his parasol winged "Miss Phila VI."

Leo Weiss, 16, of New York City, won the St. Louis meet with his twin ruddered all-balsa monoplane, also of the moveable wing type. Francis Tlush of Lyndhurst, N. J., and Herbert Greenberg, indoor title holder, are other prominent "gas job" builders who concentrate on the moveable wing models.

Opinion is divided as to the relative merit of straight wings that begin their dihedral at the fuselage, and those having a long flat center panel with sharply rising tip sections. The latter are often referred to as "double-dihedral" or "polyhedral" wings. While somewhat ungainly in appearance, they seem to minimize slipping at the take-off and do not hinder the soaring qualities of the plane.

Experts contend that, in theory, there is "no difference" between these two types of wing structure. The prospective builder may make his choice with the knowledge that records are held by models having both types of wings.

Present N.A.A. regulations allow the

Leo Weiss, the winner. Duration 64 mins.—12 secs.

Maxwell B. Bassett, a veteran in gas model construction.

Hubert Lacey, winner of the open class event. Time: 17 mins.—58 secs.

contestant one-fourth ounce of fuel for each pound of model plane weight, and prescribe that no gas-powered model shall weigh over seven pounds.

A four or five pound plane is therefore handicapped as to duration, although it may climb faster than the heavier plane and thus reach the upper air and favorable currents before the official allotment of fuel gives out. However, the present record holders weigh close to seven pounds and Leo Weiss' winning plane has a wing loading of over one pound per square foot.

Of the many types of construction appearing at the N.A.A. meet, the most popular combination embodied a balsa covered fuselage with wings of rice paper or fabric on balsa and basswood frames. Other models were entirely balsa covered, the fuselage in some cases being of the shell type. While somewhat heavy, the hollowed balsa shell offers great strength combined with unlimited shaping and streamlining possibilities.

Scale model builders find that increased dihedral in combination with enlarged tail surfaces improve the performance of their "gas jobs," since the requirements of inherent stability are much greater in the model than with its prototype.

Landing gears of all types must be exceedingly tough and solidly built, yet resilient to normal landing shocks as well as those of "pancaking" and one-wheel landings of the "hot" variety. Since the gas model cannot be conveniently leveled off and allowed to settle to the ground, its striking energy must not be under-rated.

The building of a successful landing-gear does not stop with its attachment to the fuselage, and stresses must be worked out entirely through the fuselage to the point of wing attachment.

Gas-powered model building has already claimed large numbers of young men who feel that they have graduated from the rubber string class. In addition, its attractiveness as a first quality and entirely scientific sport is rapidly being recognized by many other groups including pilots of regular airplanes.

Tlush's model in a steep climb.

Bassett's model taking off.

Winford Davis and his model Corben Super-Ace, the full scale drawings of which appeared in POPULAR AVIATION.

Army Flyer Decorated

ONE day not long ago, Lieut. Frederick L. Anderson, Jr., of the Air Corps, accompanied by a mechanic, took off from Crissy Field, California, in a two-seater observation plane. He was maneuvering over San Francisco when suddenly he felt a hot breath of air on his face and saw angry flames leap out from the exhaust stacks of his engine.

Immediately, he put a wing down, kicked opposite rudder and sideslipped violently, hoping to fan the flames away from the plane and put the fire out. The flames died down for a second, but then flared up again, raging back into his cockpit like a blowtorch. Anderson realized that it was useless and yelled to his mechanic to bail out. That gentleman lost not an instant in going over the side and Anderson himself climbed out of his cockpit and prepared to leap backward into space.

Suddenly he looked down and saw that the plane was falling directly toward the crowded streets of the city. He shuddered when he realized what would happen.

Immediately he climbed back into his cockpit, which was now a seething mass of flames. The heat was terrific and Anderson had difficulty in keeping from fainting. However, he managed to keep his senses long enough to fly the plane away from the city. As soon as it was over San Francisco Bay, Anderson jumped with his parachute.

Having narrowly escaped death by fire, it now seemed as if he were going to meet death by water, for he landed in the bay and his heavy flying clothes weighed him down. Moreover, his parachute became water-logged and submerged, dragging him down with it Fortunately, the *U. S. S. Oklahoma* appeared on the scene in the nick of time and one of her crew dived in and rescued the flyer.

Anderson has just been awarded the Distinguished Flying Cross by the War Department with a citation which stated:

"Had Lieut. Anderson not displayed an extraordinary amount of courage, coolness, and disregard for his own self, the airplane probably would have crashed in a congested part of the city, thus possibly causing considerable loss of life and destruction to private property."

A Four-Cycle Model Engine

RECENTLY, a model two-cylinder opposed four-cycle engine has put in an appearance in Chicago, which is highly interesting and very efficient.

Each cylinder has an inlet and exhaust valve with tappets, complete, and runs very much smoother than the more common two-cycle engine. Further, the fuel economy of the four-cycle engine is much better than the older type and greater duration is had per unit quantity of gasoline. This shows the new trend of development in model engines that should have a marked effect upon endurance records.

A Fairchild Amphibian Model

by PAUL W. LINDBERG
Model Editor of POPULAR AVIATION

HERE is a model which we are sure you will thoroughly enjoy building. The rubber motor has been very cleverly strung through the nacelle to the rudder fin. Please note, hatch is removable to permit use of larger flying propeller. The model is complete with all movable controls.

COLOR SCHEME

Fuselage—silver; paint bottom working up around front of nose, black. Wings—silver; international orange panels on top side of wing. Nacelle and tail surfaces—silver. Details—black.

CONSTRUCTION OF FUSELAGE

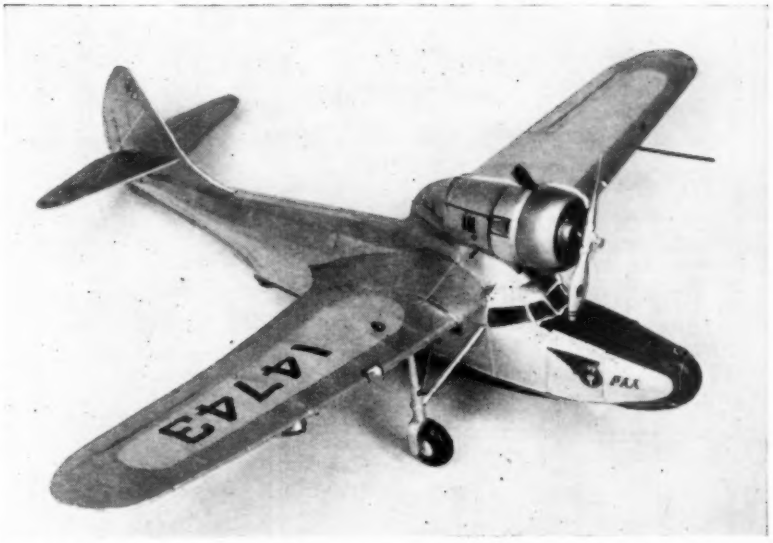
First, place waxed paper on top of plan to prevent parts from sticking to it. The fuselage sides are built from $\frac{1}{8}$-inch square balsa. The longerons, verticals, diagonal braces, etc., are held in place until securely cemented by inserting straight pins on either side of strips wherever needed.

When the two sides are completed, the cross-members are cemented into their proper locations. Check carefully front to rear for alignment.

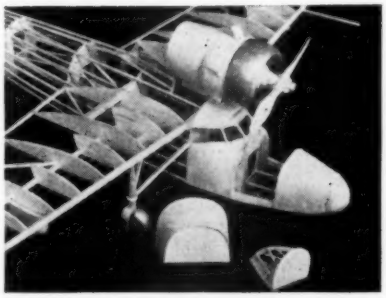
Cut formers from $\frac{1}{32}$-inch sheet balsa and cement in their respective positions as shown on the plan. The position of all stringers are clearly shown on the formers. See plan. Work stringers from front to rear and check carefully to see that they have the correct spacing. Stiff paper is required between nose block formers 1 and 17, formers 2 and 3, formers 4, 18, and 5, 19; also for roof of cabin.

CONSTRUCTION OF NACELLE

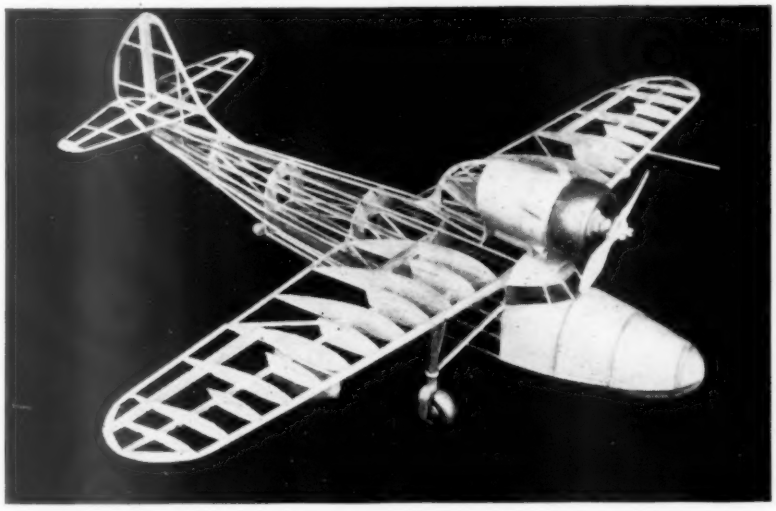
Cut the various formers from balsa and cement in their proper locations. In order to receive installation, make cover at rear of nacelle removable. Stiff paper is used for covering nacelle back to and including former 25. The space between the roof of cabin and bottom of nacelle is filled in with a piece of stiff paper cut to fit. Construction of motor is clearly shown on plan.



This is a dead ringer for the full size plane shown on the cover of this issue. It is a beautiful and unusual type of model that flies well.



This is a detail showing the hatch removed for giving propeller clearance.



The complete frame of the Fairchild amphibian before covering. Note the construction of the nacelle.

CONSTRUCTION OF WINGS

Cut all ribs from $\frac{1}{32}$-inch balsa. Pin the spar in position on the plan. Now, cement ribs in their proper locations. The leading and trailing edges are cut and sanded to shape and cemented to the ribs. The panels carry movable ailerons which are a great help for controlling the flights. Make wing tips from $\frac{1}{16}$-inch thick balsa. We highly approve of this type of wing tip, because it is much easier to construct and neater in appearance.

ELEVATOR AND RUDDER

These are built from $\frac{1}{16}$-inch square and flat balsa, and are constructed on the plan. Their construction is very simple; therefore, no difficulty should be encountered here.

WING FILLETS

They are made of stiff paper, which is carefully cut and made to fit between fuselage and wing root.

LANDING GEAR

The construction of all parts is clearly shown on the plan. To assure strong landing gears, it is very important that these are reinforced with piano wire.

COVERING THE MODEL

Apply tissue to the various framework members, using a light grade of model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When edges have dried, apply coat of water

(*Concluded on page* 186)

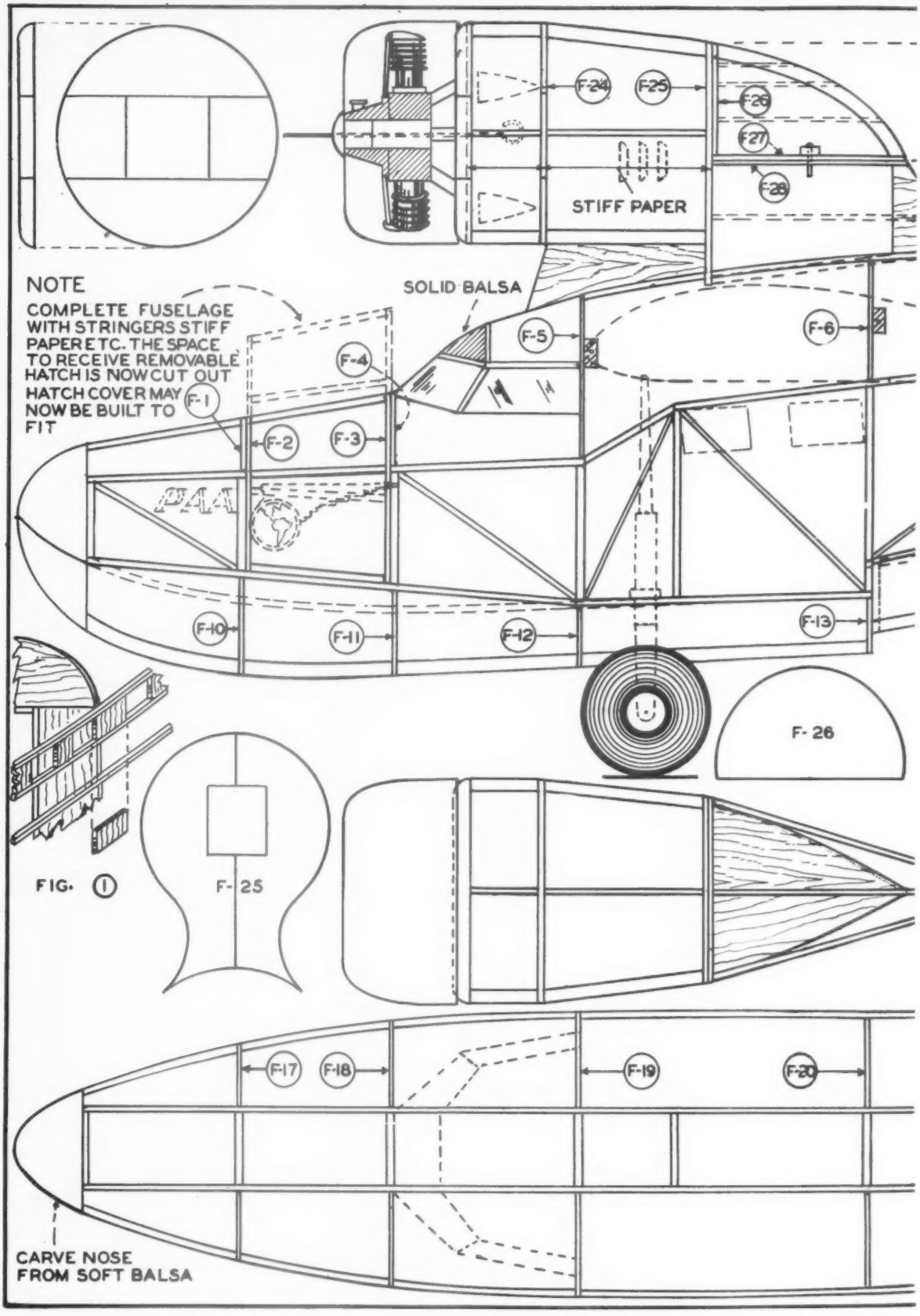
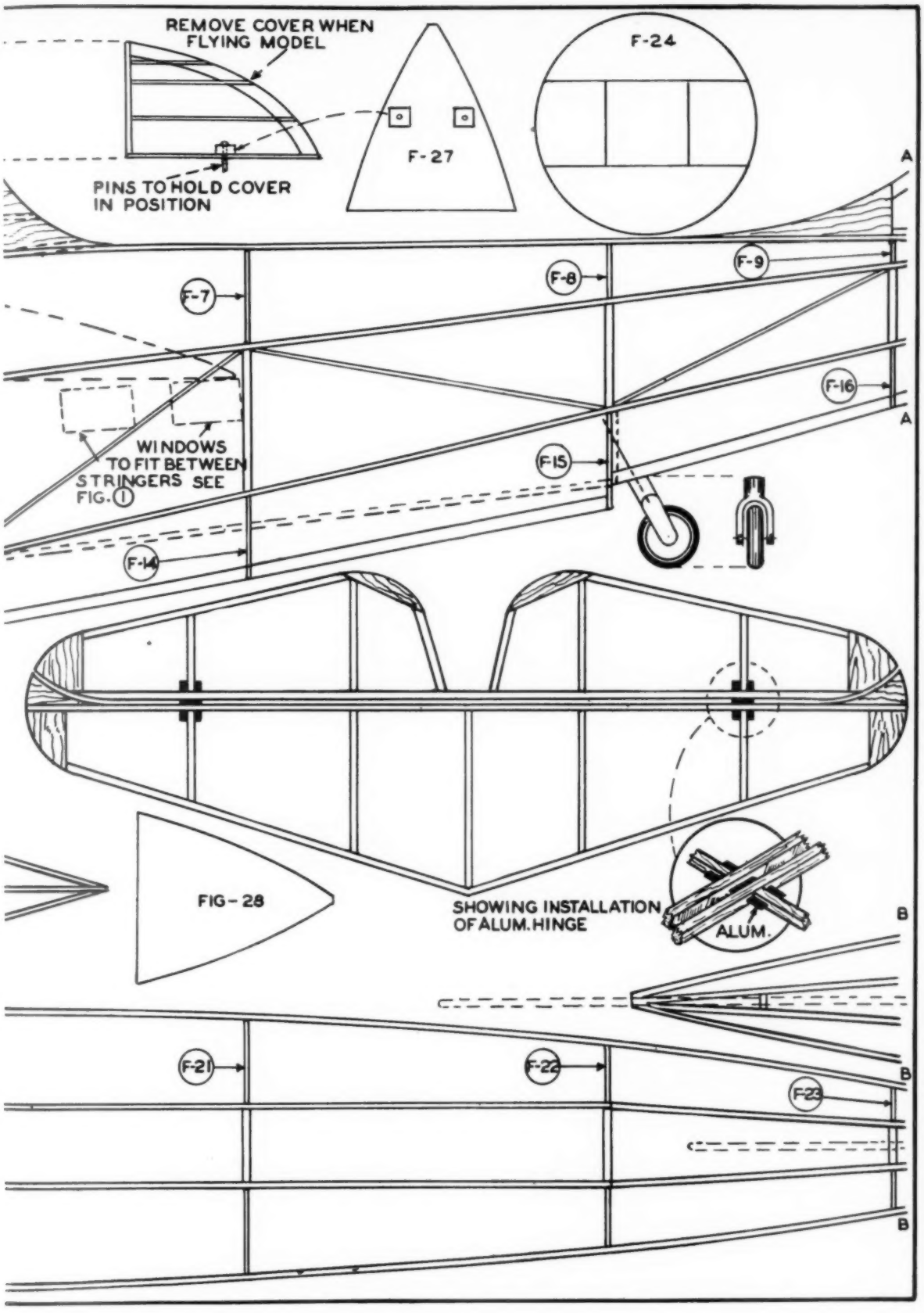
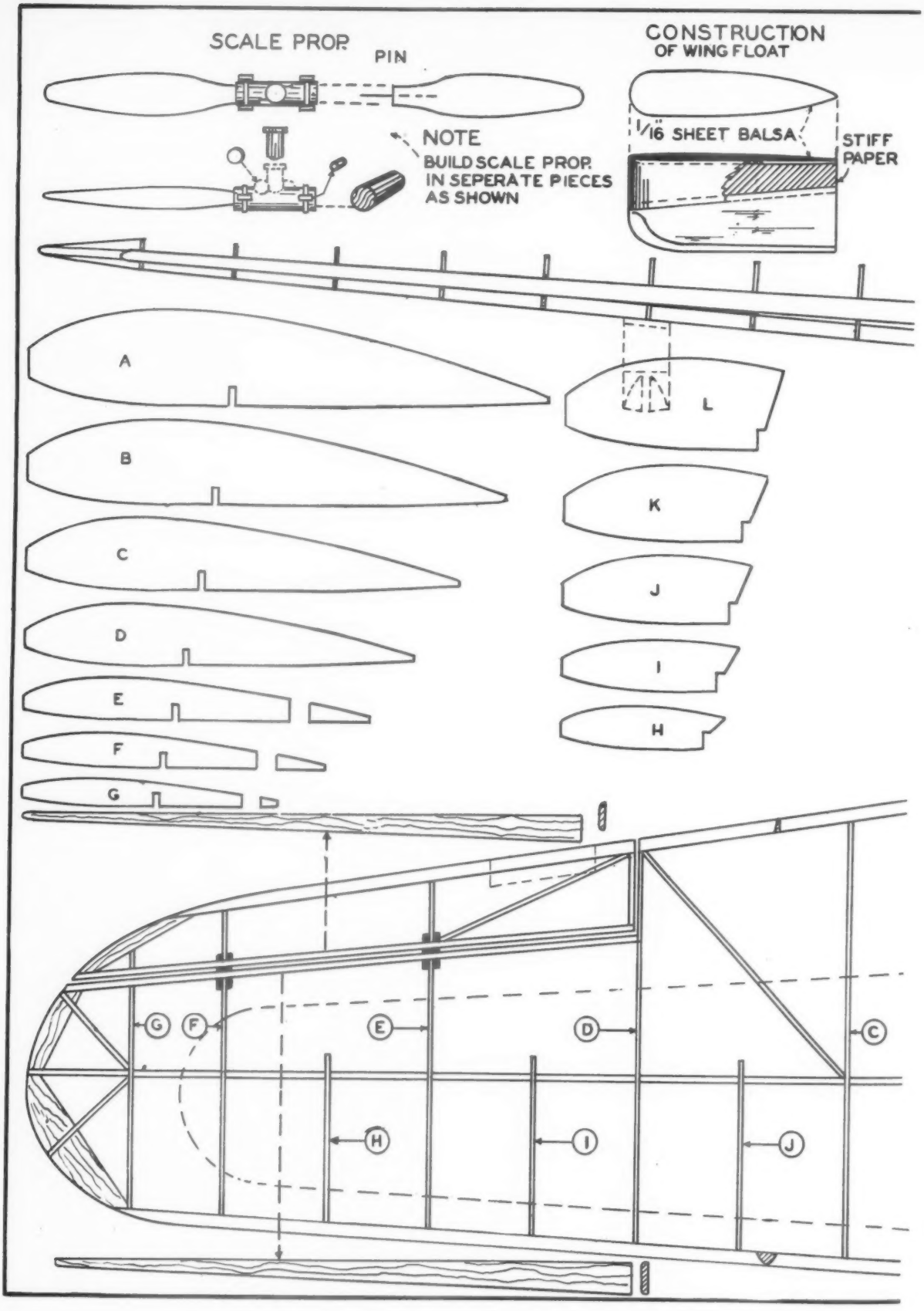
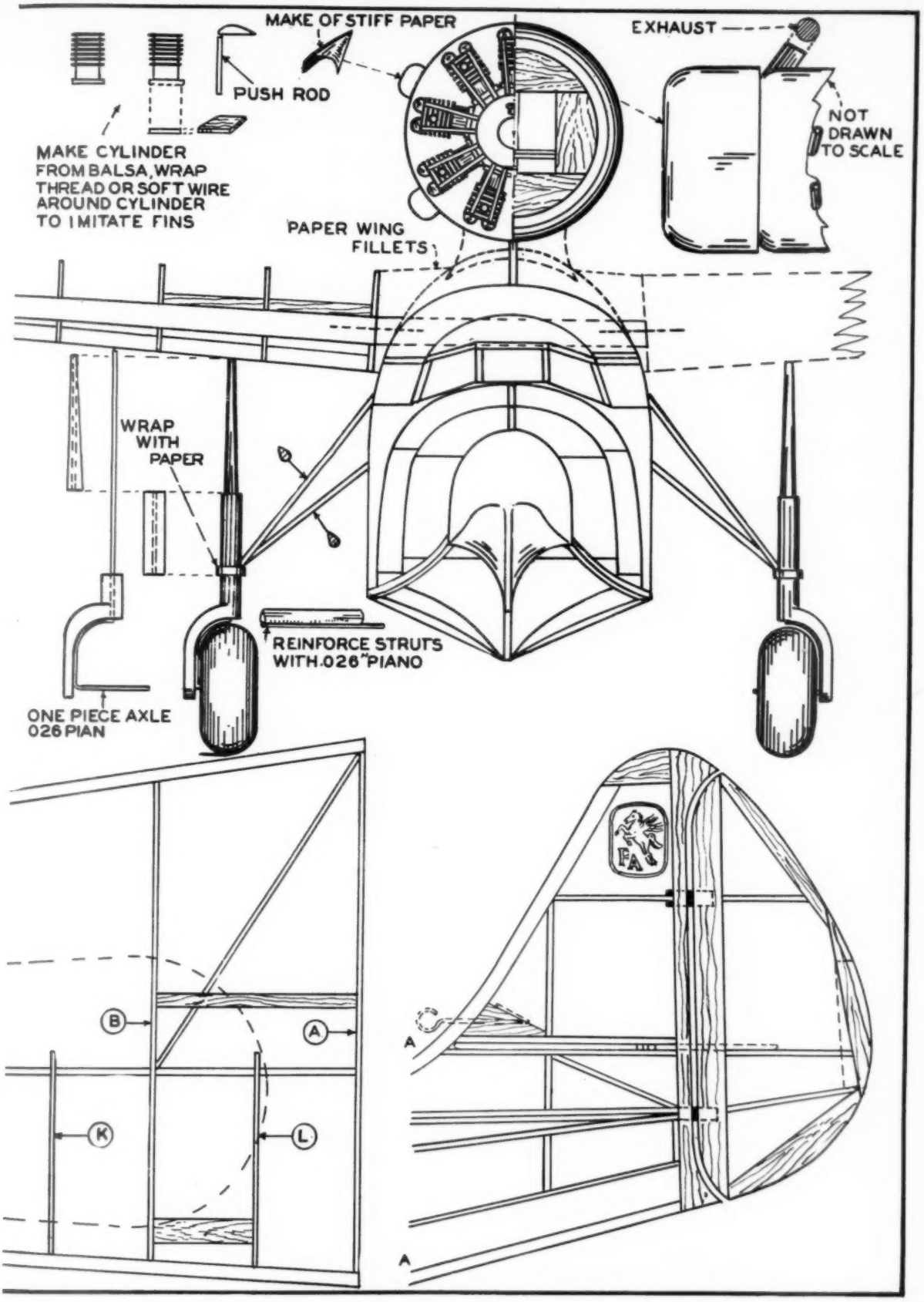
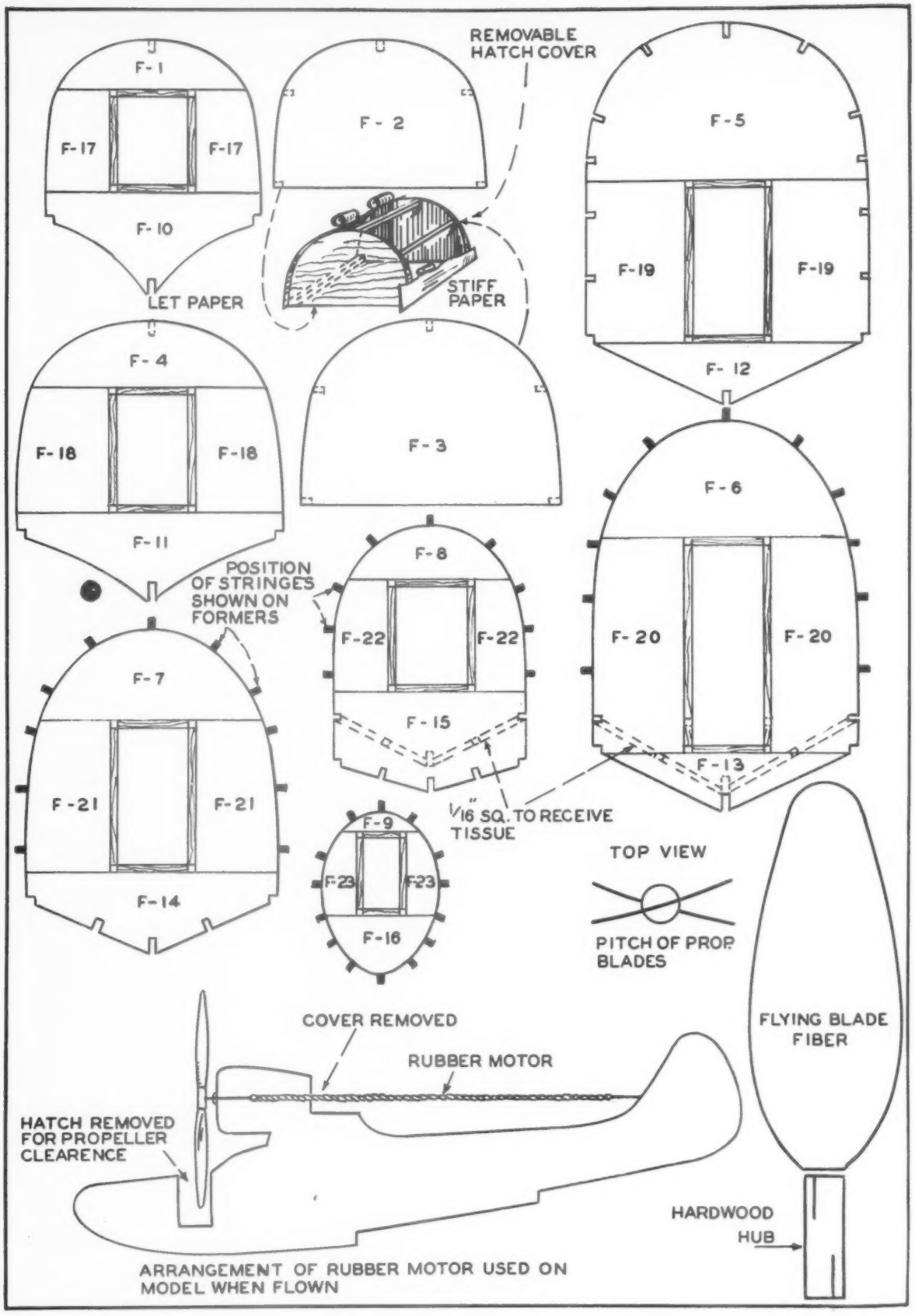

F-24
F-25
F-26
F-27
F-28
STIFF PAPER
NOTE
COMPLETE FUSELAGE WITH STRINGERS STIFF PAPER ETC. THE SPACE TO RECEIVE REMOVABLE HATCH IS NOW CUT OUT HATCH COVER MAY NOW BE BUILT TO FIT
SOLID BALSA
F-1
F-2
F-3
F-4
F-5
F-6
F-10
F-11
F-12
F-13
F-26
F-25
F-17
F-18
F-19
F-20
CARVE NOSE FROM SOFT BALSA

FIG. 1


REMOVE COVER WHEN FLYING MODEL
PINS TO HOLD COVER IN POSITION
F-27
F-24
A
F-9
F-8
F-7
F-16
A
WINDOWS TO FIT BETWEEN STRINGERS SEE FIG. 1
F-15
F-14
FIG-28
SHOWING INSTALLATION OF ALUM. HINGE
ALUM.
B
F-21
F-22
F-23
B
B

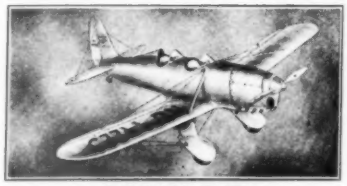

SCALE PROP.
PIN
NOTE
BUILD SCALE PROP. IN SEPERATE PIECES AS SHOWN
CONSTRUCTION OF WING FLOAT
1/16 SHEET BALSA
STIFF PAPER
A
B
C
D
E
F
G
L
K
J
I
H
G
F
E
D
C
H
I
J


MAKE OF STIFF PAPER
PUSH ROD
MAKE CYLINDER FROM BALSA, WRAP THREAD OR SOFT WIRE AROUND CYLINDER TO IMITATE FINS
EXHAUST
NOT DRAWN TO SCALE
PAPER WING FILLETS
WRAP WITH PAPER
REINFORCE STRUTS WITH .026" PIANO
ONE PIECE AXLE 026 PIAN
B
A
K
L
A
A
FA


F-1
F-17
F-17
F-10
LET PAPER
F-2
REMOVABLE HATCH COVER
STIFF PAPER
F-5
F-19
F-19
F-12
F-4
F-18
F-18
F-11
F-3
F-6
F-20
F-20
F-13
POSITION OF STRINGES SHOWN ON FORMERS
F-8
F-22
F-22
F-15
F-7
F-21
F-21
F-14
1/16" SQ. TO RECEIVE TISSUE
F-9
F-23
F-23
F-16
TOP VIEW
PITCH OF PROP BLADES
FLYING BLADE FIBER
COVER REMOVED
RUBBER MOTOR
HATCH REMOVED FOR PROPELLER CLEARENCE
HARDWOOD HUB
ARRANGEMENT OF RUBBER MOTOR USED ON MODEL WHEN FLOWN

TWENTY-FIVE YEARS OF IDEAL SUPERIORITY

A Quarter Century of Model Building Experience Brings You the Sensational Advances in the New IDEAL Super-Detail Models



RYAN S T

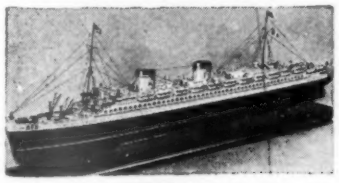
Wingspan 22½", length 16½", weight 2½ oz., scale ¾". New fast Ryan has dual control system which operates in either cockpit; adjustable wing flaps; plans for making an actual working engine—4 cylinders with movable pistons, carburetor and spark plugs. Complete kit **$1.50** Postpaid.

BOYS HERE IS A SPECIAL OFFER YOU CANNOT AFFORD TO MISS

NORMANDIE

Construction Set of the Finest, Newest Ship Afloat—a 12" Model of the Beautiful NEW FRENCH LINER—NORMANDIE. It is only..... **35c** Postpaid.

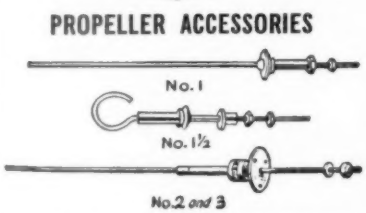
Build the NEW Super-Detail model Italian liner REX



REX

29"—scale ⅛" to the foot. Patented Hull Design Shaped hull and over 100 metal fittings. 24 cast metal lifeboats; 24 cast stairways; 2 cast anchors; 4 metal propellers; 6 cast bits; 48 metal davits. The Rex comes in beautiful high luster original colors of black, orange, white, red and green; and the kit also contains turned wood parts, printed wood, cement, wood filler, sandpaper, etc., postpaid **$6.00**

PROPELLER ACCESSORIES



Increase the efficiency of the propeller by eliminating friction and you will get better, longer, swifter flights. IDEAL Propeller Shafts help the motor deliver more power to the propeller. Made in Ball-Bearing and Plain Styles, threaded and with all fittings included.

No. 1—Plain Style, 1/16 in. shaft.....Each 10c
No. 1½—Same, with hook bent.....Each 15c
No. 2—Ball-Bearing, 1/16 in. shaft, flange drilled for attaching propeller.....Each 25c
No. 3—Same, ⅛ in. shaft.....Each 40c
Postage Extra, 3c

OUR many years of experience is your accepted guarantee of expert craftsmanship. For over a quarter of a century the IDEAL name has been the standard of model planes. In no other plane at any price can you get these many unusual advantages—the tested and proved features — the high quality and recognized authenticity of IDEAL super-detail models.

IDEAL Planes are quality planes first, last, and all the time because they are built up to the highest standard of perfection—never down to a price. They are designed by engineers who really know planes—who know how to design and build planes that are absolutely authentic, exact in scale, and guaranteed to fly.

That is why experienced model builders, fellows who have built all types of planes, prefer IDEAL. We have many letters on file from boys all over the country which stand back of that statement. Let IDEAL prove its superiority to you. See your dealer or send the coupon.

Roland Ware Wins a Blue Ribbon with IDEAL

"Ideal Aeroplane & Supply Co., Inc.
22-28 W. 19th Street, New York City.

Gentlemen:

My 'Super-Detail' Stinson is a blue ribbon winner. At the Camden County Hobby Fair, sponsored by the Rotary Club, it took first place in the model division. It was in competition with 125 other scale model planes of many kinds and makes.

I feel that my success was due to the high quality materials and accurate plans in the kit. I hope to get another of your kits and make a much better plane for next year's Fair.

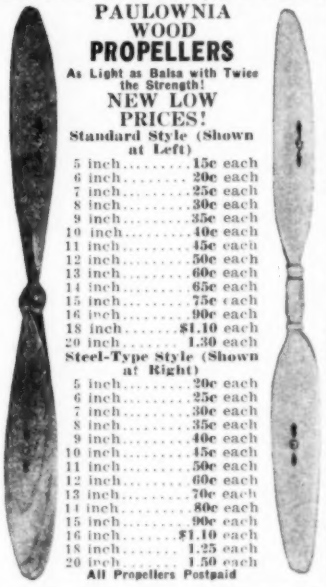
I am recommending the 'Super Detail' kits to all my friends and I hope I can gain more honors with my plane.

Yours very truly,
ROLAND WARE. (Signed)
Berlin, N. J."

SEND 5c FOR ILLUSTRATED CATALOG

Contains Complete and Interesting Information

Now is the time to get acquainted with the many new features—the real value that is built into IDEAL kits. Send 5c TODAY for the colored illustrated catalogue that shows the latest model planes and boats. It also contains valuable information on how you can make real money by building and selling these famous flying models.



PAULOWNIA WOOD PROPELLERS

As Light as Balsa with Twice the Strength!

NEW LOW PRICES!

Standard Style (Shown at Left)

5 inch.....15c each
6 inch.....20c each
7 inch.....25c each
8 inch.....30c each
9 inch.....35c each
10 inch.....40c each
11 inch.....45c each
12 inch.....50c each
13 inch.....60c each
14 inch.....65c each
15 inch.....75c each
16 inch.....90c each
18 inch.....$1.10 each
20 inch.....1.30 each

Steel-Type Style (Shown at Right)

5 inch.....20c each
6 inch.....25c each
7 inch.....30c each
8 inch.....35c each
9 inch.....40c each
10 inch.....45c each
11 inch.....50c each
12 inch.....60c each
13 inch.....70c each
14 inch.....80c each
15 inch.....90c each
16 inch.....$1.10 each
18 inch.....1.25 each
20 inch.....1.50 each

All Propellers Postpaid

DEALERS: You can make more money with IDEAL products. Write for details of many model airplanes and ship models.

IDEAL AEROPLANE & SUPPLY CO., INC.

22-26 West 19th Street, New York, N. Y.

Pacific Branch:
Model Boat & Aircraft Co., 1356 Fifth Ave., San Diego, Calif.
Canadian Branch:
Canadian Model Aircraft, 3007 St. Antoine Street, Montreal

SEE YOUR LOCAL DEALER OR SEND THIS COUPON

IDEAL AEROPLANE & SUPPLY CO., INC.
22-26 West 19th Street,
New York, N. Y.

Please send the items I have checked. I am enclosing $.....
(West of Denver 25c extra. All planes postpaid.
Canadian Prices 40% higher to cover duty.

Ryan S T $1.50
Rex 6.00
Normandie 35

ILLUSTRATED INFORMATION on model boats and aeroplanes—5c.

Please Print NAME.....

ADDRESS.....

CITY.....STATE.....

BUFFALO PUBLIC LIBRARY, DEPARTMENT OF TECHNOLOGY

Clubs

(*Continued from page* 156)

At the present time, there are over one thousand members enrolled. The organization is non-commercial and is to be run on a co-operative basis. They are to have their own planes and airports for the use of the members. The organizer can be reached at the Boston Press Club, 3 Beacon St., Boston, Mass. Applications from airplane and engine mechanics are solicited.

* * *

THE Lodi Airmen's Club has recently been formed at Lind's Airport, five miles north of Lodi, Calif. It is located in the center of one of the world's greatest wine belts and the club hopes to participate in the great aeronautical pageant in Lodi's yearly Grape Festival.

Twenty-one charter members, banded together for the purpose of technical and social advancement, are meeting on the first and third Wednesdays of each month, according to Art Harris, the corresponding secretary of the club. These meetings take place at the airport club-rooms and the club is selecting their membership from licensed and student pilots. Mr. Harris can be reached at 121 N. Hutchins St., Lodi, Calif.

* * *

MR. A. B. FRUCHEY, who has been a model builder since the days of the Wright pushers, writes an interesting letter concerning the Findlay Model Aviation Club, Findlay, Ohio. Organized seven months ago, it now has a membership of fifty-three.

They have been holding model contests twice every month with worthwhile prizes to the winners. A ten cent entry fee is charged for purchasing the prizes, etc., and there are no dues. In every contest, some member offers a built up model or kit as a reward. "Money," Mr. Fruchey says, "is not important in a club where there is such remarkable co-operation." Mr. Fruchey can be reached at 634 Center St., Findlay, Ohio.

* * *

WILLIAM BEERMAN, A6 Dolly Madison Apts., Greensboro, N. C., writes to tell us of the American Airplane Photo Exchange Club of which he is secretary. They will welcome any applicants for membership who have good collections of airplane photo negatives, size 116 or 616.

* * *

FORMATION of a nation-wide civilian aerial reserve organization moved a step nearer realization, recently, when the Civilian Air Reserve Corps merged with the Falcon Air Corps of America. Jointly, they are in better condition to spread the movement than alone. The Civilian Air Reserve Corps was a non-profit, non-political group headquartered in the Hollywood, Calif., Athletic Club. The Falcon Air Corps of America was a national flyers' organization.

The new corps, sponsored by a number of prominent aviation executives and educational leaders, proposes by means of large scale operation to provide a thorough aviation training at nominal cost. This, the sponsors believe, will create a potential aggregation of private pilots that may be readily converted into a military unit.

Lt. Comdr. C. S. Williams, U. S. N. R., who gained special distinction for plotting Amelia Earhart's transoceanic flights, is now holding weekly classes in navigation and meteorology for the corps at the Hollywood Athletic Club.

Prof. J. F. Ball, M.A., A.E., head of aeronautics, Los Angeles Junior College, is personally conducting classes in the aeronautical sciences.

* * *

DOWN in East Chicago, Ind., The East Chicago Flying Club is making plans for the future. This organization was started in October, 1934, and is prospering according to the vice-president, Walter Opasik. While we hesitate to have our club news take on the aspect of a statistical rendition by a board of directors, yet the financial idea back of the club is so interesting that we feel the urge to present the dope.

The members pay their initiation fee in installments of $5.00 per month until a total of $35.00 is paid in. With ten active members all paid up, the old sock will be holding $350.00 with which the club expects to buy a two or three-place biplane for training. At present there are only eight members in the club, but they are already considering bids on a plane. They have contacted a veteran transport pilot, located at Lansing Airport, who has over 3,500 hours and who is willing to play the role of instructor.

Besides learning to fly a plane, the club has another ambition, notably to get an airport for East Chicago. This city is about 30 miles south of Chicago and the members believe that a prosperous port could be built up at this point. This club can be reached at the Boy Scouts Hut, East Chicago, Ind.

* * *

WE TAKE great pleasure in announcing the Fort Pierce Flying Club of Fort Pierce, Fla. This energetic club has ten charter members of which six members have graduated as solo flyers and the others are taking instruction. It won't be long now until all of the membership is in the air—literally, and few clubs can show such a record.

They plan to have a Taylor Cub for a training plane and a hangar for its storage. A professional instructor is being arranged for and they expect to have everything in operating order before long. This is decidedly interesting and we congratulate our Florida readers for their activity. They are very and justly proud of the new Fort Pierce airport on which $25,000 has already been expended.

END.

BOYS! MODEL BUILDER'S KNIFE FREE

WITH ORDERS OF $1.00 AND OVER

BALSA PROPELLER BLOCKS

1/4x3/4x6, 1 for 1c	6 for 5c
1/2x3/4x5, 1 for 1c	5 for 5c
5/8x1x8, 1 for 2c	3 for 5c
3/4x1x8	2 for 5c
3/4x1 1/4x12, 1 for 3c	2 for 6c
1x1 1/2x12	2 for 11c
1x1 1/2x15	1 for 7c

BALSA SHEETS, 18" LENGTHS

1/32x2, 5 for 6c	10 for 10c
1/16x2, 5 for 6c	10 for 12c
3/32x2, 3 for 5c	7 for 10c
1/8x2, 1 for 2c	6 for 8c
3/16x2, 1 for 3c	3 for 7c
1/4x2, 1 for 4c	3 for 9c
1/2x2, 1 for 5c	3 for 14c

BALSA, 18" LENGTHS

1/16x1/16	85 for 5c
1/16x1/8	40 for 5c
1/16x3/16	20 for 5c
1/16x1/4	18 for 5c
3/32x3/32	35 for 5c
1/8x1/8	30 for 5c
1/8x1/4	6 for 5c
1/4x1/2	4 for 5c
1/2x1/2	2 for 5c

MISCELLANEOUS

INSIGNIAS, 1 sheet of 24 ..... 5c
WASHERS, 1/4 and 1/2 doz. 1c
SANDPAPER, package 5c
WIRE, 3 ft. 1c, 36" lengths.
ALUMINUM LEAF, 2 sheets for 1c
DOWELS, 1/6x12 ....10c per doz.
PROPELLER SHAFTS, 2 for.. 1c
NOSE PLUGS, large and small ....12 for 5c
THRUST BEARINGS 1c
BRUSHES, No. 6..... 5c
MODEL PINS, large and small ..... 5c pkg.
HARDWOOD BEARINGS, 2 for 1c
BUSHINGS, 1 doz..... 3c

PLANS

9" Plans, each 6c, 3 for....15c
15" Plans, each 8c, 3 for....20c
20" Plans, each 10c, 3 for....25c
WACO BIPLANE
TEXACO SKY CHIEF
Spad Chasseur
Sparrow Hawk Swift Curtiss
Vought Corsair Gee Bee
Douglas Dolphin Amphibian
TWIN SKYFLIER
SKY CLOUDSTER
CURTISS GOSHAWK

BALSA, 18" PLANKS

1x1, 2 for	9c
1x2, 1 for	9c
2x2, 1 for	16c
2x3, 1 for	20c
2x6, 1 for	35c

BAMBOO

1/16x12	40 for 5c
1/16x1/4x15	6 for 5c
Shredded	40 for 5c

JAPANESE TISSUE

1 doz. all colors..... 16c

SHEET CELLULOID

2x6 ..... 3c
6x8 5c; 12x16..... 18c

CLEAR DOPE

1 oz. 5c
1/2 pt. 25c

COLORED DOPE

1 oz., 5c; 1/2 pt..... 30c

THINNER BEST

1 oz. 5c

CLEAR CEMENT

1 oz. 5c
1/2 pt. 30c

WOOD VENEER PAPER

20x30", 1 for..... 9c
2 for 17c

REED

1, 32, 1/16, 1/8.....3 ft. 1c

RUBBER MOTORS

1/16 sq. .....20 ft. 5c
1/8 flat .....20 ft. 5c

FRENCH, AMERICAN, ENGLISH, GERMAN

INSIGNIAS—1 1/4" .....4 for 3c
INSIGNIAS—2" 1c

WOODEN WHEELS

1/2", pair 2c
3/4", pair 3c
1", pair 4c
1 3/8", pair 5c
1 3/4", pair 8c

CELLULOID WHEELS

3/4", pair 5c
1", pair 7c
1 3/8", pair 9c
1 7/8", pair 15c

BALSA BALLOON WHEELS

1/2" .....pr. 3c
3/4" .....pr. 4c
1" .....pr. 5c
1 3/8" .....pr. 6c
2" .....pr. 9c
3" .....pr. 16c

MACHINE PROPELLERS

5" 5c
6" 6c
7" 7c
8" 8c

DUMMY RADIAL ENGINES

1 1/2" Diameter 20c
1 3/4" Diameter 25c
3" Diameter 30c

Send 3c stamp for "HELPFUL HINTS FOR MODEL BUILDERS" and catalog for other bargains. This Booklet FREE with all orders.

ORDERS 75c or under 15c postage. Postage prepaid on orders over 75c. West of Mississippi add 10c extra. Canada add 15% of order extra. CASH OR MONEY ORDER—NO STAMPS. No C.O.D.'s.

SKYWAY MODEL AIRCRAFT SUPPLY CO.

383 SEVENTH AVE., BROOKLYN, N. Y.

SELLEY-TEX HAILED... as GREATEST IMPROVEMENT in "model" history

PAT. APPLIED FOR

NEW REVOLUTIONARY IDEA in SIMPLIFIED BUILDING is going over BIG!

FULL MONEY BACK GUARANTEE on all of SELLEY'S exclusive FLYING MODEL KITS

Endorsed by aviation experts and acclaimed by everyone who tries them, SELLEY-TEX CONSTRUCTION SETS offer you the easiest, quickest and most practical way to assemble a model airplane ever created. You must actually SEE and TRY this amazingly simple construction idea to appreciate the difference between this MODERN METHOD OF MODEL BUILDING and old-fashioned impractical Balsa Stick Kits. Why pay "so-called" bargain prices for worthless kits you cannot assemble? When you compare what you GET with what you PAY, SELLEY-TEX CONSTRUCTION SETS are INEXPENSIVE! SELLEY invites you to make your own comparisons and judge for yourself! Order yours TODAY!

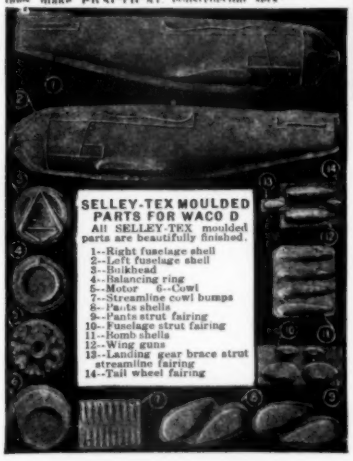
WACO D Military **4.00** 25c Postage

WACO D MILITARY. A wealth of military detail characterizes this formidable prototype of the latest Army innovation, and what a flyer!

The SELLEY-TEX moulded parts included in this kit are shown at the right. These together with special parts and materials as listed complete this outstanding value.

SELLEY-TEX! AMERICA'S *only* MODEL KITS with MOULDED PARTS

The manufacture of moulded parts takes more time, finer materials and more skillful workmanship, but it does make PRACTICAL construction sets!

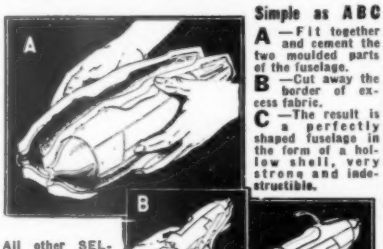


Simple as ABC

A—Fit together and cement the two moulded parts of the fuselage.

B—Cut away the border of excess fabric.

C—The result is a perfectly shaped fuselage in the form of a hollow shell, very strong and indestructible.



All other SELLEY-TEX moulded parts as listed are equally easy to build.

LISTED PARTS AND ACCESSORIES

Packed in a beautiful, sturdy box with finished scale flying, adjustable pitch metal prop, finished propeller shaft and rear hook, scaled wheels, with brass bushings, ribs printed out accurately on white sheet balsa, many special turned wood parts, finest grade of balsa wood, sticks, tail wheel and fork fittings, control horns and wire, pure para rubber, special bamboo paper, authentic markings, colored insignia, best quality cement, colored dopes, full-size easy-to-understand plan, complete with all picture details. All the tools necessary to build model:

CLAMPS—RAZOR BLADE, BRUSH, SANDPAPER

ALL 24-INCH WING SPAN

West of Denver or Foreign 10c extra.

WACO C Cabin **3.50** 25c Postage

WACO C CABIN. A masterpiece of authentic model design, incorporating every scientific feature to insure maximum flying performance.

Fully detailed SELLEY-TEX moulded fuselage, bulkhead, balancing ring, cowl, cowl bumps, pants, pants fairing and a special full-scale 9-cylinder motor, with metal push-rods and a special moulded celluloid cabin windshield; the many special scale parts and materials as listed complete this amazing value.

RYAN Sportster **3.00** 25c Postage

THE NEW RYAN SPORTSTER. An exceptionally realistic miniature, embodying every modern principle of light commercial planes to assure long distance flying.

The SELLEY-TEX moulded parts included in this kit are as follows: Fuselage, balancing ring, nose piece, spinner head rest, rudder fairing and combination pants and landing gear; these together with special parts and materials as listed complete this outstanding value.

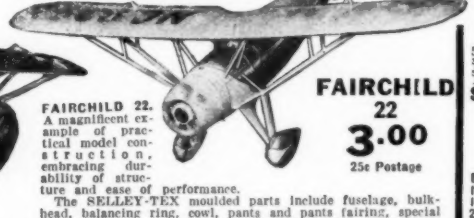
DEALERS!

Cash in on the growing demand! Write for discounts, propaganda, etc.

GOSHAWK **4.00** 25c Postage

GOSHAWK. A powerfully attractive flying scale replica of the speedy Navy fighter and accurate to the minutest detail.

The following SELLEY-TEX moulded parts: Fully detailed fuselage, bulkhead, head rest, balancing ring, drag ring, bombs, belly tank, wheel shoes, shoe fairing, tail wheel fairing and a special fully scaled 9-cylinder motor, detailed with push rods, all the fine scale parts and materials as listed complete this very extraordinary value!



FAIRCHILD 22 **3.00** 25c Postage

FAIRCHILD 22. A magnificent example of practical model construction, embracing durability of structure and ease of performance.

The SELLEY-TEX moulded parts include fuselage, bulkhead, balancing ring, cowl, pants and pants fairing, special 7-cylinder radial motor to scale with push rods, and exhaust fairing, also all materials and special parts as listed complete this remarkable value.

FREE Write for our beautiful, two-colored broadside illustrating in detail the new line of incomparable SELLEY-TEX Construction sets. Send 3c stamp for postage.

BUY the FINEST QUALITY PARTS and SUPPLIES

from the largest manufacturer of

MODEL AIRPLANE ACCESSORIES

in the world

Bombs and TORPEDOES

13/16" 5c
1¼" 8c
3" Torpedo..15c

DUMMY MOTORS
Something New
9 Cylinder
1" dia. 30c
1½" dia. 50c

Die Cast New Guns

WITH RING MOUNT
1¼" long B 25c
1⅝" long A 30c

SWIVEL TYPE GUNS C
2" Double Action 15c

PURSUIT TYPE GUNS D
¾" long 5c
1" long 5c
1½" long 5c

TYPE E
1⅜" long 10c

TYPE F
1⅝" long 10c

G DUMMY RATCHET GUN
⅞" long 5c

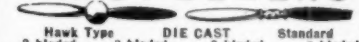
3c Postage

WHEELS

SEND 5c FOR CATALOG

Aluminum Disc Rubber Tired Wheels		Aluminum Disc Rubber Tired Air Wheels	
½" dia.	5c ea.	1" dia.	15c pr.
⅝" dia.	6c ea.	1¼" dia.	18c pr.
¾" dia.	7c ea.	1½" dia.	20c pr.
⅞" dia.	8c ea.		
1" dia.	9c ea.	**Celluloid Wheels**	**Balsa Wheels**
1⅛" dia.	10c ea.	¾" dia.	06c pr. 04 pr.
1¼" dia.	11c ea.	1" dia.	08c pr. 05 pr.
Balloon Tire Alum. Disc Wheels		1¼" dia.	10c pr. 07 pr.
1½" dia.	25c pr.	1⅝" dia.	18c pr. 10 pr.
1¾" dia.	28c pr.	3" dia.	35c pr. 35 pr.
2" dia.	30c pr.	**Balloon Tired Celluloid Disc Wheel**	
Treaded Rubber Tire Aluminum Disc		1½" dia.	30c pr.
1 3/16" dia.	30c pr.	1¾" dia.	33c pr.
1½" dia.	40c pr.	2" dia.	35c pr.
2" dia.	50c pr.	**AXLES Threaded and fitted with washers, bushings and nuts.**	
3" dia.	60c pr.	**Lengths**	1/16 3/32 1/8
5⅜" dia.	$1.50 pr.	2"-3"-4"	.10 .12 .20
6½" dia.	$2.00 pr.	5"-6"-7"	.12 .14 .20
7" dia.	$2.50 pr.	7"-8"-9"	.14 .16 .23
Axle Fork and Swivel Joint		10-11-12"	.18 .15 .25
½ up to ⅝" wheel	10c	Postage 3c pair, on Rubber Tired Wheels, 4c pair	
¾ up to ⅞" wheel	15c		

PROPELLERS



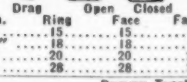
Hawk Type 2-bladed		Hawk Type 3-bladed		DIE CAST 2-bladed		Standard 3-bladed	
3½"	25c	4"	35c	1½"	8c	1½"	10c
4"	30c	4½"	45c	2"	10c	2½"	12c
4½"	35c	5"	50c	3½"	15c	4"	25c
5"	35c	5½"	60c	4"	20c	4½"	35c
5½"	40c	6½"	70c	4½"	25c	5"	45c
6½"	40c	7"	80c	5"	30c	6"	60c
7"	55c	8"	90c	5½"	35c	7"	70c
8"	65c	9"	$1.00	6"	40c	8"	80c
9"	75c	10"	1.10	6½"	45c	9"	90c
10"	85c	11"	1.23	6¾"	50c	10"	$1.00

Props can be had up to 24 in. dia. Postage 6c each.

CELLULOID MOTORS

Separate Cylinders		Celluloid Dia. Motors		Alum. Cowl Plates		Celluloid Motor & Cowl Combination	
5/16"	3c	1½"	25c	⅞"	8c	1½"	25c
⅜"	4c	2"	30c	1¼"	10c	3"	35c
½"	5c	3"	35c	1¾"	12c	Postage 3c	

Spun Aluminum COWLS



Dia.	Ring	Face	Face
1"	15	15	15
1½"	18	18	18
2"	20	20	20
3"	28	28	28

PICTURES

ON BRISTOL BOARD 2¼"x4¼" of AUTHENTIC AIRPLANES

24 ARMY ....25c Set
16 NAVY ....25c Set
16 WARTIME 25c Set
84 SQUADRON INSIGNIA....25c

Dummy Turnbuckles

¼" ....10c each ⅜" ....10c each ½" ....10c each

IMPORTANT—Minimum order, 50c. Add postage on all items but if over 15c on less than $1.50 order add only 15c. Orders over $1.50 add 10%; west of Denver 15%.

SELLEY MFG CO. INC., DEPT 409 1373 GATES AVENUE, BROOKLYN, N. Y.

XUM

Build this group of authentic "Dwarf" Flying Models of the NATIONAL AIR RACE WINNERS!

1929 Winner! **TRAVEL AIR MYSTERY**

First U. S. plane to outfly military craft. Span 14½". Suggested coloring: Red, black scalloping, green trim. Kit D-2D..... **50c**

1930 Winner! **LAIRD SOLUTION**

Piloted by late "Speed" Holman. Span 10⅝". Suggested coloring: Gold wings and tail, balance black. Kit D-46..... **50c**

1931 Winner!
Bayle's Gee-Bee

The sensation of '31. Span 11⅜". Suggested coloring: Yellow and black. High powered speedy appearance. Kit D-17B **50c**

1932 Winner!
G-B Supersport

Doolittle's famous plane. A real beauty. Span 12⅛". Suggested coloring: White, red scalloping. Kit D-27 ..... **50c**

1933 Winner! **WEDELL-WILLIAMS**

Flown by Jimmy Wedell himself. Span 13". Suggested coloring: Red and black scalloping, bronze motor case. Kit D-47..... **50c**

1934 Winner! **Turner's WEDELL-WMS**

Probably most widely known plane in America today. Span 13". Suggested coloring: Authoritative W-W gold finish. Kit D-48..... **50c**

If less than 6 are ordered

Add 10c per Kit to these prices for packing charge. If 6 or more are ordered, you save this charge. These Kits are complete except—**NO LIQUIDS.**

Ask Your Dealer

for these—If he hasn't them, order direct. Use cash, check or M. O.—no C.O.D.'s. Canada, Mexico, British Isles add 10% to these prices; other countries, 20%.

★ *Catalog of 50 C-D ¾" models—29 "Dwarfs" (½")—Supplies—5c* ★

CLEVELAND
MODEL & SUPPLY CO. INC.
1966 PAJ West 57th St., Cleveland, Ohio, U.S.A.

Aero-Sportswoman

(*Continued from page* 170)

and sideslips were easy—but try to imitate a tail-spin!

Le Bourget, the municipal airport, is reserved for commercial flying and the army. It seems to have a good sod foundation and apparently the whole field is available, as there are no surfaced runways. There are the usual wind-socks on the hangars and a wind indicator on the side of the field, but an ingenuous smoke device in the center of the field seemed to us to be an excellent addition, as it is much easier to see from the air than the ordinary wind-socks.

We flew completely around the city and visited the Guyancourt airport, which is one of the bases for Caudron-Renault Flying services. The Caudron trainer is somewhat larger, but similar to a Commandair. They quoted a price of 245 francs per hour (approximately $16), however, if one is willing to contract for ten hours or more, they will make a reduction of some twenty or thirty francs. There seemed to be considerable activity on the field. They have several planes but we were unable to secure one that day, as they were all reserved by the regular students.

We were especially interested in a new, low-wing model which has been put on the market quite recently. It is being manufactured to sell to private individuals in partnership with the Government. The individual owner paying one-half of the price (approximately $2,000) and the Government the rest, which we think is quite an ingenious way to stimulate private flying and incidently, to build up an auxiliary air force!

Guyancourt is a nice little airport, situated in the open country a few miles beyond Versailles. There is a little village near one corner of the field and some low telephone wires along one side, but the country is quite open in all directions so it is quite an ideal location for private flying. We were much amused to see a large drove of sheep on the field, which our pilot explained was to keep the grass short. A shepherd and three dogs keep them along the edges of the field during the day while the flying activities are in progress.

Returning to Le Bourget, we flew over three other airports, Buc, Villacoubly and Orly. We plan to visit these also and will tell you something about them at a later date. There is a good deal of wooded country around Paris and it is a beautiful sight from the air. The Seine winds back and forth through the valley, with the city knotted and twisted through its many loops. The Eiffel Tower on the left bank of the river and the white pile of Sacré Coeur in the north part of the city, make good landmarks in the otherwise grey jumble that might be lost in the hazy atmosphere.

END.

Model Dept.

(*Continued from page* 177)

to tissue. When all water has dried completely, tissue will become taut. May we suggest that you pin wings, elevator and such to a flat surface to keep from warping.

ASSEMBLY

The wings, elevator, rudder, landing gear, etc., can now be cemented in their correct positions. Two types of propellers are shown on the plan. The flying propeller, which is made of fiber, has less r. p. m. in order that the model can fly a greater distance. By twisting the blades, the pitch can easily be adjusted.

The scale propeller is used for exhibition purposes only. Six strands of $\frac{1}{16}$ square are sufficient to fly the model. All other details can now be assembled to the model. Remember details add to the appearance of the model.

TESTING AND FLYING

With the rubber motor and flying propeller in place, gently launch your model over tall grass, to see whether it is properly balanced. If model glides a short distance and nose rises abruptly, it will be necessary to add weight to bottom of nose block. After the model is balanced to glide at an even angle, you are ready to test your model under power.

In making the test flight, the principal thing to avoid is damage to your model. Gliding and flying it over tall weeds is the safest, because the weeds or tall grass break the fall gently in case that the model should stall or dive.

Next, look out for any solid obstructions like trees, stumps, posts or buildings, because it appears to be the tendency of every new model to attempt suicide. Be careful at the beginning, for a moment's carelessness may undo days of work.

Because of the unusual location of the motor on this model and the eccentric resistance of the engine nacelle, the balance and flight of this model is different than that of the more conventional type. Therefore, more than the usual amount of attention and care should be taken making the first test flights to insure that everything is correct. In spite of the comparatively great resistance of the nacelle and its location, this model glides exceedingly well and flies well with its rubber motor.

At first we were rather against making a model of this ship because it apparently presented so many problems and invited so many experiments, but when the model was actually built we were greatly pleased with the fine results obtained in flying the model. The resistance of the engine nacelle is much less than would be judged from its appearance and therefore, the gliding qualities are very good.

A few trial flights will acquaint you with the ship, and all other adjustments can be made through the adjustable control surfaces.

END.

Addresses

(*Continued from page* 172)

RADIO—RADIO COMPASSES

Aeronautical Radio Co., Roosevelt Field, Mineola, N. Y. Agents for Western Electric Radio apparatus, installers, etc.

Aircraft Radio Corp., Boonton, N. J. Radio receivers.

Crosley Radio Corp., Cincinnati, Ohio. Radio receivers.

Fairchild Aerial Camera Corp., Woodside Ave., Woodside, N. Y. Kruesi Radio Compass.

Lear Developments, Inc., 125 West 17th St., New York, N. Y. Aircraft radio receivers, radio transmitters, airplane radio, Lear Radio Compass.

Radio Marine Corp. of America, 66 Broad St., New York, N. Y.

Radio Navigational Inst. Corp., 72 East 40th St., New York, N. Y. The Simon Radio Guide (compass).

RCA Manufacturing Company, Inc., Aviation Radio Section, Camden, N. J. All types of aircraft radio receivers and transmitters, tubes, etc.

Trimm Radio Mfg. Co., 1528 Armitage Ave., Chicago, Ill. Headsets.

Western Electric Company, 195 Broadway, New York, N. Y. All types of aircraft radio receivers and transmitters, Broadcast transmitters, tubes and commercial radio equipment.

Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. All types of radio transmitters and receivers.

Westport Mfg. Company, San Fernando Road, Glendale, Calif. Aircraft radio receivers.

ROBOT PILOTS (AUTO CONTROL)

Sperry Gyroscope Co., Inc., Brooklyn, N. Y., and New York, N. Y. Makers of the Sperry Gyropilot.

SPRUCE (WOODS)

Air Associates. (See Supplies and Accessories.)

Pike-Dial Lumber Company, 2251 S. Loomis St., Chicago, Ill. Spruce.

Rose Airplane Co., 4439 N. Clark St., Chicago, Ill.

Schreiber Lumber Co., Wm C., Cermak Rd. and S. Throop St. Spruce, pattern lumber, hardwoods, ash.

STEEL-CABLE, STRAND, WIRE, STAY-RODS

(Structural Members)

Air Associates, Inc. (See Accessory and Supply Dealers for retail sales.)

American Cable Company, 230 Park Ave., New York, N. Y. Steel cables and stay wire for airplane structures.

American Steel and Wire Company, 208 S LaSalle St., Chicago, Ill. Steel cable, strand, wire for airplane structures.

Barbour-Stockwell Co, 205 Broadway, Cambridge, Mass.

Belden Cable & Rope Co., 4647 Van Buren St., Chicago, Ill. All sorts of electrical and structural wire and cable.

Hazard Wire Rope Co., 230 Park Ave., New York, N. Y. Cable and strand for airplane structures.

McWhyte Company, Kenosha, Wis. Makers of Macwhyte tie-rods, cable, flexible-cord for aircraft structures.

Ort, Karl. (See Accessory and Supply Dealers for retail sales.)

Roebling's (John A.) Sons Company, Trenton, N. J. All classes of steel aviation cable, wire and strand.

END.

Aptitude

(*Continued from page* 158)

who sets out consciously and systematically to kill anxieties is on the right track. And if a little too much confidence is observed now and then, it is comparatively easy to bring it within safe bounds.

Best use of the student's natural ability depends not only on good emotional adjustment but also on proper use of the mind. "Use your head!" is the continual admonition addressed to the student. He is seldom told how to use it. What the instructor really means, though he sometimes doesn't know it, is: "Use your objective imagination. Make use of what the psychologist calls rehearsal thinking." The student told to use his head is chiefly conscious that he hasn't been using it. That starts anxiety processes instead of constructive thinking processes. An instructor telling his student to use his head could very helpfully say something like the following:

"You learn to fly in your head, not in the cockpit. The most important part of the learning can be done on the ground, all by yourself. Think out what you are going to do before you do it. By that I don't mean to think about how you are going to move stick and rudder. You should soon be able to forget all about them. I mean to think about the maneuver you want the ship to go through.

Get a clear image in your mind of the pattern you want the ship to follow, and then, when you practice the maneuver, move the controls any way at all which is required to make the ship follow that pattern. Simply move the whole ship wherever you want it to go. Above all, carefully rehearse everything before you try to do it. Don't wait until it's time to act. Figure out in advance just what you would do in every situation you can think of. Analyze the mistakes you make and rehearse the proper way to do the thing in your head. Then do it in the plane."

I can testify that what I call rehearsal thinking can bring results. One day when I was a fledgling aviator of about twenty hours or so my instructor told me he was about to give up hope of teaching me how to make forced landings. If he had sent me on to the check pilot immediately I would have been washed out. But he consented to give me one more chance.

All that afternoon and far into the night I thought. I imagined myself in every situation with reference to a field—or the mesquite—that I could think of and made innumerable forced landing approaches. Next morning I rode with my instructor. I never had such a ride in my life before or since. He cut the gun every three minutes. But, to my immense relief and even surprise, I found that I knew what to do. Most of my approaches were satisfactory. All were much improved. The confusion of trying to think and act all at the same time had disappeared to a large extent literally over night.

Psychological problems arising in flight training are as variable as the natures of the students themselves, but I believe that both students and instructors can think of flying aptitude as a thing that can be assisted if not created by these methods. END.

ENGINEERING DEGREE IN TWO YEARS

B.S. Degree in Aeronautical, Civil, Chemical, Radio, Mechanical or Electrical Engineering in two years. Located in an industrial center with that Engineering atmosphere. Earn board. Low tuition. Enter September, December, March and June. Catalog.

INDIANA TECHNICAL COLLEGE
242 East Washington St., Fort Wayne, Ind.

CHICAGO'S Newest Hotel

Offers....

FREE RADIO LOUD SPEAKER
CIRCULATING ICE WATER
TUB BATH OR SHOWER
In Every Room

GARAGE.....
With Direct Entrance to Hotel

RATES—
From— $2.00 Single
$3.00 Double

HARRISON HOTEL
HARRISON STREET
(Just Off Michigan Blvd.)

OLIVER HOTEL
South Bend, Ind.
Under Same Management
Andrew C. Weisburg
President

Illustrated Booklet Sent Upon Request

Airy Chat

(*Continued from page* 142)

WE certainly commend and applaud the steps taken recently by the Bureau of Air Commerce in investigating the merits of auto engines as powerplants for lightplanes. This is certainly constructive work and it will result in much good to amateurs and private flyers who, so far, have been kept out of the air by the lack of sufficient cash to purchase a standard aviation engine.

* * *

THERE are literally hundreds of Ford engines, Chevvy engines and other lightcar engines that have proved their ability in flying lightplanes. Planes so equipped have flown well and the reliability of the engines themselves is above reproach. They are rather heavy, it is true, but we can reconcile ourselves with this disadvantage in view of the low cost, dependability and ruggedness of the auto engines.

* * *

WE are running another edition of the Aero Clubs Activities in this issue which was omitted last month because of a lack of space. Letters from the various clubs all over the country have been pouring in during the last month so that we will undoubtedly have enough material to keep us going for some time. Remember, it is up to you fellows to keep this department running. Send in the dope on your club and we'll run it—gladly.

* * *

F. F. FRAKES was a welcome visitor to our office, recently, and he told us of an almost miraculous escape he had on July Fourth while crashing a ship. You know, Mr. Frakes specializes on crashing ships for the movies and exhibitions, taking an old jillopy and plowing her into the ground from an elevation of 2,000 feet or so. But—this time he didn't get away with it so easily as he has done heretofore and he is navigating around limpingly with the assistance of a cane.

This last ship went over on her side and into a nice flat spin from which Frakes could not check, and then she spun right into the ground. Believe it, or not, the pilot received only a few minor bruises but the ship itself was kindlingwood. Yes, you nearly guessed it. The ship was an old Canuck, a first cousin to the Jenny.

* * *

JUST a note to those of our readers who have recently asked us whether the Diesel engine would save much money when installed on an airplane. They have a belief, as many layman have, that the Diesel engine is a sort of super-engine having almost unbelievable economy and power. This is not the case except under certain very limiting conditions.

Diesel fuel oil is cheap at the present time only for the reason that there is so little demand for it. If the Diesel engines should suddenly become popular and were produced in large quantities, Diesel fuel oil prices would instantly soar and the Diesel would be as expensive to operate as a gasoline engine. It is the old law of supply and demand all over again. As a matter of fact, there is more gasoline per barrel of crude oil today, by virtue of improved cracking process, than there is Diesel fuel oil. Therefore, it would not be long before a premium would be put on the Diesel fuel should any sudden spurt occur in Diesel production. This was demonstrated when kerosine tractors were being developed, the kerosine frequently costing as much or more than the gasoline formerly used.

Again, there are certain inherent defects in the Diesel engine cycle that are difficult to overcome. First, we have the difficulty of measuring out the minute charges of fuel for each stroke. Second, we have difficulty in maintaining the proper compression necessary for ignition under varying conditions of speed and load. The efficiency of this engine only reaches a high figure at a certain definite speed and load.

* * *

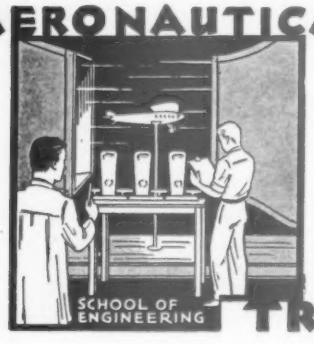
Well, so long for this time and I'll meet you here next month as usual.

J. B. R.

Other men have read and profited by our free books "Patent Protection" and "Selling an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send free "Evidence of Invention" form. Prompt service, reasonable fees, deferred payments. Write immediately to: Victor J. Evans & Co., Registered Patent Attorneys, 527-K Victor Building, Washington, D. C.

PATENT YOUR IDEA

AERONAUTICAL ENGINEERING
DEGREE IN 2 YEARS



Become an Aeronautical Engineer. Tri-State College course given in 108 weeks. Bachelor of Science degree. Graduates in Mechanical Engineering can complete aeronautical course in 2 terms (24 weeks). Thorough training in all fundamental engineering subjects. Equipped with wind-tunnel (see illustration). Non-essentials eliminated. Courses designed to save student time and money. Flying school facilities available at nearby airports. Properly trained engineers in design, research, manufacture and sales work are in demand. Enter March, June, September, January. Courses are offered also in Civil, Electrical, Mechanical, Chemical, Radio and Architectural Engineering; Business Administration and Accounting. Living costs and tuition low. Those who lack high school may make up work. World famous for technical 2-year courses. Graduates successful. Write for catalog.

795 COLLEGE AVE. ANGOLA, IND.

TRI-STATE COLLEGE

Brown's Prop

(*Continued from page* 150)

feet. With a good wind, it has taken off in about one hundred and fifty feet.

As to fuel, a safe estimate could not be given, using this motor as an example, for it was not built to revolve. It uses slightly more oil than it would in a stationary radial position, for there is a slight leakage around the valve guides. However, this would not occur in a specially built motor. The gas consumption is no more than for any motor developing the same horsepower.

Of minor importance, but far from being insignificant, is the fact that this plane has less vibration than the average motor car. Also that the suction of the rear blade tends to eliminate propeller flutter, which makes most of the propeller noise. This noise is lessened somewhat by having a slower propeller speed in ratio to the motor speed. By decreasing this ratio without the use of gears, another valuable point is accomplished.

A faster motor could be built for such a plane as this. One that would run 4,000 r.p.m., or 2,000 r.p.m. for each propeller. With a piston speed corresponding to 4,000 r.p.m., the highest centrifugal action would correspond to only 2,000 r.p.m.

This principle could only be adopted on this type of ship, as the revolutions per minute is the only factor that, by being increased, can increase the power of a motor without also adding weight.

Were it possible to put a 700 h.p. motor on Brown's thousand pound plane, that did not weigh any more than his plane of 80 h.p., the ship could be controlled just as easily if not easier, than with the present arrangement.

A pilot flying a Wedell-Williams racer, cannot open his motor up on the ground during a take-off, until the ship gains considerable speed because the torque will roll the plane. With this tandem propeller arrangement, any time that the wings will lift the ship, it is safe to take off, because there is no tendency to roll the plane.

Snapping the switch on or off has no effect upon the attitude of the plane and there is no rolling taking place under such conditions. The balance is accurate and true.

An Italian racing plane that holds the seaplane speed record involves this same principle, but uses two motors instead of one. The second motor drives a propeller in the opposite direction, counteracting the torque of the first.

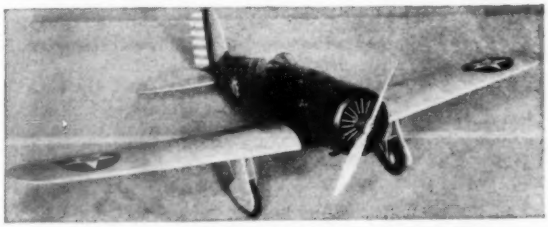
It would be a safe bet, to wager that motor torque has caused the death of more student pilots than all other causes combined. They stall their plane in a climb then, when the wings and controls fail to prevent the motor from turning the plane, it goes into a spin.

END.

NEW CURTISS F11C4 NAVY PURSUIT

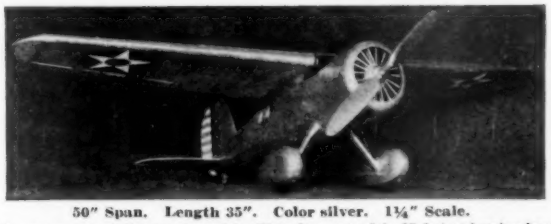
28" Span, Length 20½", Weight 4 oz., 1" Scale
THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD
A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3¾" celluloid, 700 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4" aluminum cowl ring, 9" carved spruce semi-scale flying propeller, colored star and rudder insignia, 2" celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheels pants, etc. All other parts printed on balsa. Detail scale drawing.
Construction Set Complete, postpaid **$4.50**

NEW LOCKHEED P23 ARMY PURSUIT



32" Span, Length 22½", Weight 3¼ oz., ¾" Scale Model
One of the most outstanding values in models; it has excellent lifting power, rising from land or water in a few feet. From the latest Army land plane it is convertible into Lindbergh's seaplane by attaching the floats. Construction set contains: formers, ribs, all other parts printed on balsa, 3⅝" turned cowl front, celluloid wheels, axles, colored insignias, U. S. Army lettering, semi-scale propeller, yellow and drab dope, glue, 32"x44" full scale drawing, etc.
Construction Set Complete, postpaid, Landplane **$2.50**
Seaplane Set. Same as above with printed float parts, stringers, dope, etc. Drawing showing float attachment and design **$2.95**
Combination Land and Seaplane Set, postpaid .....

NEW LOCKHEED ARMY SPEED VEGA



50" Span. Length 35". Color silver. 1¼" Scale.
A new sensational flying scale model. Rises from ground in 15 feet and makes long steady flights. Const. set contains all formers and wing ribs cut out and notched for stringers, spars, etc., wheel pants ready cut, 3" turned balsa wheels, 5⅝" turned balsa cowl front, 15" carved varnished steel type propeller shown, 5 oz. silver paint, glue, etc. Even an amateur can make a perfect model of this with ease.
Construction Set, postpaid **$8.50**

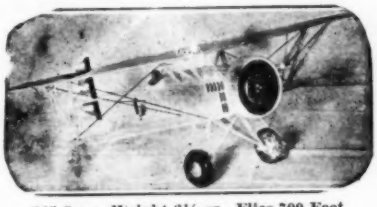
NEW BOEING F4B4 NAVY FIGHTER

22½" Span, Length 14½", Weight 2½ oz., Color, Silver and Yellow
New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished propeller, printed out balsa wood parts, silver dope, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia and ¾" scale drawing. **Construction Set Complete, postpaid.** **$2.95**

CURTISS ARMY HAWK P6E

24" Span, Weight 2¼ oz., Flies 600 Feet
The strongest and most perfect model of the P6E on the market, has squadron insignia on pants and fuselage, metal exhaust pipes, aluminum wheels, 2 color dopes, all parts printed on balsa, printed instrument board, 8" carved propeller.
Construction Set Complete, postpaid **$2.50**

CURTISS SEA HAWK P3A



24" Span, Weight 2¼ oz., Flies 700 Feet
Set includes 3" celluloid motor, aluminum motor plate, 3" drag ring, balloon celluloid wheels, printed instrument board, fuselage, wing and rudder insignia, 2 oz. silver dope, glue, etc. 8" carved Paulownia wood prop. All parts printed on balsa. Full size drawing and all parts. **Set postpaid** **$2.75**

NEW CURTISS HAWK F6C3

U. S. Navy Fighter

20" Span, Weight 1¾ oz.
This new plane is used extensively by U. S. Marines.
A scale model of one of the late Navy Hawks. Set includes all parts printed on balsa, colored insignia, 1½" celluloid wheels, lettering, silver dope, cement, glue, detail drawing and all parts to build as shown.
Construction Set, postpaid **$1.50**

BOEING F4B4 NAVY PURSUIT

1/5 H.P. Gasoline Motor Driven Model

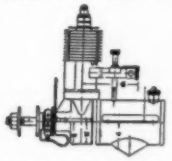
68" Span, Length 44", Color Silver
This is not just an ordinary large model, but one specially designed and engineered to stand the strain of the gas motor.
An exact scale model 1/5 the size of the real large plane rated as the finest biplane fighter in the U. S. Navy. This is the most realistic and life-like model of this size ever produced. As all the fuselage formers, wing ribs, tips, etc., are all cut out and notched for stringers, spars, etc., even a novice can make a perfect model of it with ease. Set contains 6" turned balsa wheels with bearings, rubber tail wheel, a special turned balsa 10" speed, cowl ring used on the latest Boeings, silk covering material, silver and red dope, glue, full size scale drawing, axles; all wood cut to size, etc. Weight of model with motor 3½ lbs.
Construction Set Complete, without motor, postpaid **$25.00**

NEW 1935 CATALOG—Send 3c Stamp

You will find this the most interesting catalog on scale flying rubber and gas motor driven models ever published. Beautifully illustrated, size 8" x 10". Also gas motors, supplies, 36" Gar Wood speed boat, electric or gas motor driven.

1/5 H. P. Gasoline Model Motor

Weight As Shown 8 oz.



Long life motor has steel cylinder and piston, ⅞" bore x 1" stroke. Comes complete with gas tank, coil, condenser, batteries. Price ready to run, complete, postpaid. Only **$22.50**
15" or 19" laminated prop. for motor **$2.75**

Northrop FTI Navy Fighter

22" Span, Weight 2 oz., Color Silver, ¾" Scale
Exact scale model of the Navy's latest 272 m.p.h. fighter. Set includes all parts printed on balsa, 3" turned cowl front, colored insignia, lettering, 2 oz. silver dope, ¼ oz. black, 1 oz. paper cement, 1 oz. glue, 7" fibre propeller, axles, windshields, bearing button with bearing, full size detail drawing, formed wire parts.
Construction Set Complete, postpaid **$2.00**

California Dealer: JAYS MODEL AIRCRAFT, 7763 Melrose Ave., Hollywood, California

MINIATURE AIRCRAFT CORP., 83 Low Terrace, New Brighton, New York

High-Lights

(*Continued from page* 152)

minutes before he began to descend. Reed Holister, of Cheyenne, Wyoming, survivor of two airplane crashes, recently fell off a ladder and broke his arm. Two stuntmen, J. H. Hedley and Charles Weaver, thrilled Los Angeles when they jumped from airplanes and were "picked up" by planes which had dived beneath them. Small balloons attached to their bodies enabled them to maneuver into positions to drop into the planes below.

* * *

MISS Frances Buck, who is the young lady to whom I dictate this column, informs me that her Alma Mater, Iowa Wesleyan College, has awarded Admiral Richard E. Byrd an honorary degree, which reminds me to tell you that Amelia Earhart, who has completely recovered from a minor nasal operation, and Mrs. Chas. A. Lindbergh were also the recipients of honorary college degrees.

* * *

YOU may be interested to know that Paul Mantz has purchased Amelia's famous Lockheed which was built in 1931 and was purchased by John Henry Meers who later sold it to Elinor Smith, who in turn sold it to Miss Earhart to replace her trans-Atlantic plane which has been placed on exhibition in the Smithsonian Institute.

* * *

HAVING retired the Winnie Mae, following his fourth failure to set a stratosphere record, Wiley Post intends to test his new Lockheed Orion, with a flight to North Siberia where he will hunt tigers. . . . He will be accompanied by Mrs. Post and Fay Gillis, first woman member of the Caterpillar Club.

* * *

DURING the run of the Louisville Derby, Dick Merrill flew an Eastern Airliner to Louisville which really rated as a millionaires' special having aboard: Jesse Jones, Ben Smith, Wall Street operator, Bruce Barton, Grant Rice, Deak Aylesworth of N.B.C., Capt. Eddie Rickenbacker, Kenneth Walsh, Walter Hughes, Jack Bickel, Stan Kahn and Thomas Fortune Ryan, 3d.

Over Pittsburgh, Bickel, a Canadian multimillionaire, suggested a pool on the Derby buying two extra tickets for the pilot and copilot, telling his wealthy companions that he hoped the pilots would win first and second prize, adding however, "No doubt one of you millionaires will pick the winner as them that has, gets."

Mr. Bickel was 100 per cent right as Thomas Fortune Ryan drew Omaha winning first prize of $275.

* * *

PILOT "Tarzan" McHale, the very eminent aerial golfist, post cards that Mike Caffarello, the Bluebird Tycoon, has traded hangars with the Standard Oil Company and that flying Doctor Reynolds of Elmhurst reports the addition of a two-place Porterfield. Mac also says that Pilot Art LaPointe is coming along very nicely with his Calumet Air Corps.

Tarzan concludes with the recent memorial services held at Stinson Airport in tribute to the pilots who have already winged their way West. Pilots who participated were Kermit Hobbs, Art LaPointe, W. A. McHale, Dixon Webb, Lawrence Tiedt, H. C. James, John Bokos, Fred Strine, Miss Loretta Breen, Judge Bob McMillan, Paul Caraher, Ed Seymour and George Vest.

* * *

MATE Parks of Pan American Airways writes that the Pan American airliners are now manned by Captains and Mates and with the new titles go brand new uniforms with gold braid n' everything. According to Pilot Dan Lindsey, American Airlines have also gone in for new uniforms.

* * *

FROM South America comes, too, a request asking if I could persuade Doctor Alan Dafoe to grab a clipper as Captain Smith has been passing out cigars on the arrival of quintuplets—no, not a la Dionne—but five little dachshunds—you know—two dogs long and half a dog high.

* * *

PILOT C. F. Zeier of Chicago and Southern Air Lines takes his pen in hand to say that Hap Andersons are Blessed Eventing and that Joe Taff goes in for fishing by using his hand as bait.

* * *

DOCTOR James C. Braswell, president of the Aero Medical Association, writes that the next annual meeting of the association will be held in San Antonio, Texas, from November 1 to November 3. Best wishes for a successful conference, rich in accomplishments.

* * *

HANGAR FLYING: Eddie Rickenbacker commanded a recent flight to commemorate the pioneering achievement made on June 13, 1910, by the late Charles K. Hamilton who at the time made the longest flight then on record requiring 3 hours and 34 minutes. Peter Dana, nineteen-year-old great-grandson of Henry Wadsworth Longfellow and Richard Dana, claimed a new junior mark of 34 hours and 46 minutes for the cross-country hop. R. J. Reynolds, Jr., aviation enthusiast, former owner of Roosevelt Field, New York, and heir to tobacco millions, has purchased a fast tri-motored commercial plane.

* * *

IN nine years American Airlines has flown more than 66,000,000 miles. The House military affairs committee has asked the War Department for the inspector general's report on Major General Benjamin D. Foulois, chief of the army air corps. A cup of coffee served two years ago during a flight, was climaxed with the wedding of Stewardess Ida C. Barth and Joseph E. Baer. Happy Landings!

END.

Accidents

(*Continued from page* 148)

dispelling much of the old hazard of uncertainty. The "air mass" system, about which much has been written, has, with a remarkable degree of accuracy, forecasted weather as far as five days in advance.

The Bureau of Air Commerce is getting the air line operators together to further safety, reliability and development. Thus, pooling the experience and needs of all lines, the Development Department is moving forward into a new era of usefulness, provided the Government will appropriate sufficient funds to carry on the work efficiently.

The projects on the slate at the present time include study to permit air transport operations at the base of the stratosphere, installation of radio and lights at fields for blind-landing, a system of airport and airways traffic control to govern aircraft engaged particularly in instrument flying; development of a plane for less than 10 passengers for feeder routes, ice elimination and its effect on radio, development of an aircraft engine of 1000 horsepower or more and several types of larger planes to accommodate increase in traffic on the trunk lines.

Personally, the Department, practically forcing the lines to cooperate in such a manner gives me a big laugh of satisfaction. With a great many of the lines it has always been their habit to solemnly get together with others for the purpose of cooperation on some project or other and then blissfully set about cutting each other's throats in the process.

The project of developing substratosphere flying on long routes will prove to be intensely interesting, for it opens up an entirely new and unexplored field for operation, promising greater reliability and speed. Problems of supercharging and cooling of engines and a reliable system of oxygen supply for pilots and passengers are the first obstacles to be overcome.

To return to the tables of accident statistics, there is little to say about them that a study of their contents will not more fully reveal. They are quite illuminating to the interested and careful observer, and are suited for those who wish to dig into the subject.

There has been a considerable amount of argument on the subject of pilot experience, whether a pilot grew better or more subject to accidents as his air-hours increased. This is just one more problem to settle.

In brief summary, it is evident that the lines have quite a way to go before problems of safety and reliability of operation will warrant the wide spread use of air travel which we all are striving mightily to bring about. Though the industry has shown remarkable growth in the nine years of its existance, there is a long path ahead.

END.

1/3 ACTUALLY The SIZE OF REAL PLANES! 5 FOOT FLYING SCALE MODELS $1 EACH

PLUS 35c FOR PACKING, POSTAGE AND INSURANCE

IF EXPRESS COLLECT SEND ONLY $1.00

Boys! This is the most amazing offer in model airplane history! It is almost impossible to believe—but really true—that you may send immediately for our New Giant Models and build planes that are 1/3 the size of real passenger carrying planes. Doesn't this take your breath away? Yes, sir—gigantic models and each a strong outdoor flyer!—a $10.00 value for only $1.00! Everything is in the kit INCLUDING ALL LIQUIDS—nothing else to buy! There is no catch! Over 15,000 of these models have been sold and built, 5000 during the last month (proof of this in our files), and we have received highest praise from model builders for giving such tremendous values. Inspect our kits at any dealer or read for yourself what each kit contains. If you are not convinced that our kits are the biggest values, don't order. If you already realize what bargains our kits are, send your order today and in a few days you will be the owner of a beautiful flying scale model that will make you the envy of your schoolmates and neighborhood.

5 FT. STINSON RELIANT

5 ft. Monocoupe

5 FT. HEATH PARASOL

CONTENTS: Each of these new G. H. Q. Giant 5 ft. Model Planes contains full size Plans, all ribs, formers and curved parts clearly printed on best grade Balsa. Large bottles Cement and Dope, different colors Japanese Tissue, Special Endurance Rubber, finished Redy-Cut 3" Wheels, Wire, Balsa strips cut to size, Washers and . . . Movable Controls, shock-proof Landing Gear, Scale Details, Lettering, Numbering and Insignias, Flight Log, etc.

NOTE: We have dealers in almost every city. Visit your dealer first for our kits. If you cannot locate a dealer who can supply you, order direct from us. Send money order, check, stamps, or cash. Send only one dollar if you want express delivery, charges collect.

24 HOUR SERVICE ON ALL ORDERS

G. H. Q. KITS

FLY BETTER ! ALL HIGH QUALITY
COST LESS ACCURATE for EXPERTS
CONTAIN MORE ! EASY for BEGINNERS !

"900 FOOT FLIGHT"

Wellsville, Ohio.
May 28, 1935

G. H. Q. Model Airplane Co.,
564 P. South Boulevard, New York, N. Y.

Dear Sir:

Enclosed please find a money order for $1.35 for which please send me your 5 ft. Monocoupe.

I have built your five foot Stinson Reliant and it turned out all right. I got flights of 900 feet from it.

I want to build this monocoupe and see what kind of flights I get from it.

Please send the Monocoupe as soon as possible, because I am anxious to get started on it.

Sincerely yours,
Robert Truax,
R. D. 1, Wellsville, Ohio.

"5 FT. STINSON WON FIRST PRIZE"

Jacksonville, Florida.
4/27/35

G. H. Q. Model Air. Co.
N. Y. City.

Gentlemen:—

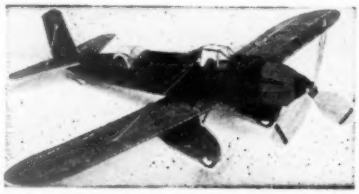
Your postal 13th inst. rec'd and I thank you for the 5 ft. Kit you are sending for our contest.

I am pleased to advise you that your 5 ft. Stinson won first prize yesterday at the Jacksonville Fair (Duval Co.). It was a wonderful job, in white, and won the Blue Ribbon over a hundred other models. I sold the kit to Dan Stormes who built it.

Yours truly,
W. L. Timpone.
TIM'S

36" Flying Scale Models 50c plus 20c packing, postage, insurance

G. H. Q. Scale Models are the best Kits your money can buy for appearance and flights. Buy one today and you'll buy a whole fleet of them. Get acquainted with G. H. Q. Kits and no others will do.



36" CURTISS A-8 ATTACK 50c; ALSO 36" NORTHROP GAMMA "SKY CHIEF" 50c 36" DOUGLAS Y-12 50c—COMPLETE IN EVERY DETAIL—

AT YOUR DEALER OR DIRECT

DEALERS! WE HAVE A COMPLETE LINE OF KITS FROM 10c TO $1.00. WRITE FOR DETAILS AND DISCOUNTS.

G.H.Q. MODEL AIRPLANE CO.

564 P. Southern Boulevard, New York, N. Y.

And Don't Forget These Marvelous G. H. Q. Values:

24" FLYING SCALE MODELS 25c plus 10c packing, postage, insurance

Each 24" G.H.Q. Kit is complete in every detail. A liberal quantity of everything. 18 models to select from at 25c each.

Puss Moth
Polish Fighter
Army Falcon
Sopwith Camel
Fokker D-7
SE5
Aeromarine
Army Hawk
Monocoupe
Fairchild "22"
Aeronca
Fokker D-8
Nieuport
Douglas Mailplane
Stinson "R"
Curtiss JN4
Bellanca

24" CURTISS ROBIN, 25c

Buy these kits at your dealer—order by coupon or letter

G.H.Q. MODEL AIRPLANE CO., 564 P. SO. BLVD., NEW YORK, N.Y.

Enclosed find $..... Please send the following kits as checked.

12" SOLID KITS
- ☐ Boeing 247D
- ☐ Ryan Racer
- ☐ G.A. Coast Guard Amphibian
- ☐ D.H. Comet
- ☐ Lockheed Orion
- ☐ Sikorsky S-41
- ☐ Douglas Airliner
- ☐ Dewoitine D-33
- ☐ U.S. Army Martin Bomber
- ☐ Monocoupe 145D

15c each Postpaid

24" FLYING KITS
- ☐ Curtiss JN4
- ☐ Bellanca
- ☐ Nieuport
- ☐ Douglas Mailplane
- ☐ Stinson "R"
- ☐ Puss Moth
- ☐ Fokker D-7
- ☐ Fokker D-8
- ☐ Polish Fighter
- ☐ Monocoupe
- ☐ Falcon
- ☐ Aeromarine
- ☐ S. E. 5
- ☐ Sopwith Camel
- ☐ Aeronca
- ☐ Fairchild
- ☐ Army Hawk
- ☐ Curtiss Robin

36" FLYING KITS
- ☐ Douglas Y-10
- ☐ Curtiss A8 Attack
- ☐ Northrop Gamma "Skychief"

5 FT. FLYING KITS
- ☐ Monocoupe
- ☐ Stinson Reliant
- ☐ Heath Parasol

SEND MONEY ORDER, CHECKS, STAMPS OR CASH. Don't Fail to Include Postage for Each Kit With Your Order. One-Day Service.

Name .....
Street .....
City ..... State .....

BUFFALO PUBLIC LIBRARY
DEPARTMENT OF TECHNOLOGY

XUM

Wright Field

(*Continued from page 162*)

field and Ft. Knox in Kentucky, point out the remarkable progress made in this line by Wright field engineers.

The results of the war game were, of course, kept highly confidential, but it is rumored that the 62nd Coast Artillery, crack anti-aircraft regiment, with its extremely sensitive sound detectors, was almost helpless against airplanes equipped with the latest Wright field silencing devices.

It is said that at night, airplanes using the silencer flew back and forth over the sound detectors, at comparatively low altitudes, without being discovered and "shot down". Even more success is anticipated by Wright field engineers engaged in developing the mufflers and in quieting propellers.

Although the military advantage of this development has been stressed, it is needless to add that the mufflers will be of great use on commercial airlines, where it is necessary to quiet the engines and propellers so that passengers may ride in comfort.

The most recent spectacular achievement of the division and in most authorities' opinion, the most outstanding, was the development of a system for instrument flying, including blind approach to an airdrome, and blind landing upon it. The name of Captain Hegenberger, as was previously mentioned, is automatically associated with this.

Captain Hegenberger deserves full credit for this splendid achievement. Having already been awarded the Distinguished Flying Cross for the flight to Hawaii, Captain Hegenberger received an oak leaf cluster to add to his cross, for his numerous blind landings when working out the system. Many have been proposed and tested by various agencies, but the air corps instrument landing system is the only one by which blind solo flights and landings have been accomplished.

The fact that, recently, a class of student officers at the field met extremely rigid blind flying and landing tests, with only a short period of instruction from Hegenberger and his associates, and in a completely hooded cockpit, proved that a practical and reliable method for overcoming the airplane's greatest handicap—lack of visibility in fog and storm—had been achieved.

The basic agency employed in the new system is an entirely new radio compass, designed by Geoffrey Kruesi, one of the field's radio engineers. Kruesi's compass, which allows the use of any radio transmitter, commercial or otherwise, received widely-publicized tests just recently when the so-called "mystery ship," a Douglas transport chartered by the bureau of air commerce, and flown by Captain Hegenberger, who had been "loaned" to the bureau, made flight after flight hundreds of miles out to sea, and returned unerringly to the Oakland, Calif., airport. In all likelihood, this compass will be used on Pan-American airways' ships engaged in the new trans-Pacific service.

The aim of the branch's engineers—an aim which has been met, of course—was to obtain an instrument landing system sufficiently inexpensive, mobile, and reliable for practical use on all types of airdromes, and sufficiently simple of operation to be used by the average pilot.

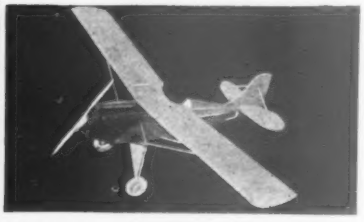
The Kruesi compass, for instrument flying, and the Hegenberger system, for instrument landing, will increase the safety of blind flight immensely. Why then should not aviation authorities consider this one of aviation's greatest boons?

It would be impossible, save with unlimited space, to enumerate and discuss all of the many projects in this one of more than fifteen experimental branches at Wright field. Direction of flight indicators, bank and turn indicators, artificial horizons, more sensitive altimeters, air-speed indicators, directional gyroscopes, aperiodic compasses, drift sights, and other safety instruments, as well as the problem of inter-plane communication in the air, such as in squadron maneuvers, are just a few of the problems receiving the attention of the equipment branch and the radio laboratories.

Radio is receiving a whole lot of attention at Wright Field these days and every day sees great advances in the closely associated science. Aviation radio has always been the history of military radio, even from the earliest days during the World War.

Suffice it to say that these men, of whom very few are ever heard of outside of aviation circles, are carrying on, day after day, engaged in making flying safer, more comfortable, and more efficient, and doing a splendid job of it.

END.



36-INCH CORBEN SUPER-ACE
36-INCH FOKKER D-VII **1.00** P. P. EACH

BOYS! The biggest bargain in kits on the market. You'll say so, too, when you see these new models.
Complete—nothing else to buy. Best quality materials and plenty of them. Plenty of dope, cement, AA Jap tissue, Grade A balsa, printed rib sheets, printed formers, wire parts formed, finished propeller, real scale full size 36" wingspan plans, etc.

36-INCH CURTISS GOSHAWK **1.35**
Complete. Postpaid .....
Free offer not included with these kits.

18 IN. LENGTHS
1/16x1/16.....100 for 5c
1/16x1/8..... 35 for 5c
1/8x1/8..... 30 for 5c
1/8x1/4..... 10 for 5c
1/4x1/4..... 5 for 5c
1/2x1/2..... 2 for 5c

18 IN. SHEETS
1/32 and 1-16x2 8 for 10c
1/8x2 ..... 6 for 10c
1/4x2 ..... 3 for 9c

18 IN. PLANKS
1x1 1 for 4c|2x2 1 for 18c
1x2 1 for 10c|2x3 1 for 23c

JAPANESE TISSUE
1 doz. all colors, AA 19c

SILVER TISSUE
20"x24" .....each 5c

SUPER-FINE TISSUE
White Only
Sheet, 5c; dozen, 50c

BALSA WHEELS
½" .... 3c ¾" ... 4c
1" .... 5c 1¾" ... 7c
2" ...10c 3" ...17c

DOWELS
1/16x6 .....doz. 5c
⅛x18 .....2 for 5c

WIRE
2 ft. 1c. 25 ft. 10c

INSIGNIA SHEETS
24 and strips..... 5c

WASHERS
1 doz. ⅛ and ¼..... 1c

PROPELLER BLOCKS
½x ¾x 6.....6 for 5c
⅝x1 x 7.....3 for 5c
¾x1 x 8.....3 for 5c
¾x1¼x12.....1 for 4c
1 x1½x12.....1 for 7c

MODEL PINS, pkg... 5c
THINNERS, 1 oz. bot. 5c
REED, 2 ft. 1c
BUSHINGS, 1 doz.... 3c
SANDPAPER, pkg... 5c
PROP. SHAFTS, doz. 8c
NOSE PLUGS, doz. ..10c

BIRCH WHEELS
½" ....2c ¾" 3c
1" .....4c 1¼" 5c
2" 10c

SHEET ALUMINUM
.005 in. thick, 15c sq. ft.
.010 in. thick, 20c sq. ft.

CLEAR DOPE
1 oz.....5c ½ pt.....30c

FREE
With every order of $1.00 or over postpaid—
2 oz. bottle CLEAR CEMENT and 100 1/16x1/16x18 BALSA STRIPS

COLORED DOPE
1 oz. bot., all colors... 5c
CLEAR CEMENT
1 oz. bot. 5c; 2 oz. bot. 10c
½ pt. bot.....35c

MACHINE-CUT PROPS.
5" ..... 5c 6" 6c
7" ..... 7c 8" 8c
10" ....10c 12" 12c

BAMBOO
1/16x1/16x12...36 for 5c
1/16x¼x15, ea. 1c; doz. 10c

THRUST BEARINGS
Small, doz. 10c
Large, doz. 15c

RUBBER
1/16x1/16 .....18 ft. 5c
1/8 flat .....15 ft. 5c

WOOD VEN. PAPER
20x30 ..... 1 for 10c

SHEET CELLULOID
6x8....5c 12½x16..20c

CELLULOID WHEELS
¾" pr. 5c 1¾" pr. 10c
1" pr. 7c 1⅞" pr. 17c

DUMMY RADIAL ENGINE
1½"d.18; 2"d.23; 3"d.33

ENGINE AND COWL ATTACHED
1½" dia. 20; 3" dia. 35

CELLULOID PANTS
½" to 1".....pair 18
1⅜" to 1⅞".....pair 33

ALUMINUM COWLINGS
1½" 15; 2" 18; 3" 25
Specify whether anti-drag, closed, or open.

BOMBS
¾" 04; 1¼" 07; 3" 12

GUNS WITH RING MOUNT
1¼" ....10; 1¾" 15

PURSUIT MACHINE GUNS
¾", 1¼" or 1¾" ea. 05

PROPELLERS

	2 blades	3 blades
1⅛"	.08	.10
2⅛"	.12	.15
3⅛"	.18	.20
4⅛"	.20	.25

WING AND TAIL LIGHTS
12", 10c; 15", 15c; 24", 20c

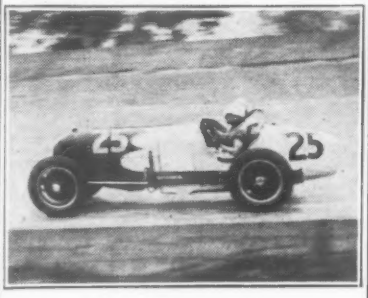
Postage paid on all orders in United States for 75c or over. Under 75c, add 10c. Canada and foreign, add 15%. Free catalog. NO STAMPS.

20 IN. FLYING PLANS 10c— 3 for 25c
Sparrow Hawk, Boeing Trans. 247, Spad Chass., Vought Corsair, Curtiss Swift L. W., Waco Cabin Biplane, Douglas Dolphin, Boeing P-12-F, Fokker D-VII, SE5, Goshawk, Gee Bee.
Dealers, Clubs, Schools: Write for Price List.

IMPERIAL MODEL AERO SUPPLY, Dept. A
416 McDonald Ave., Kensington Sta., Brooklyn, N. Y.

Will trade for modern cabin plane-

FASTEST DUESENBERG RACE CAR IN AMERICA

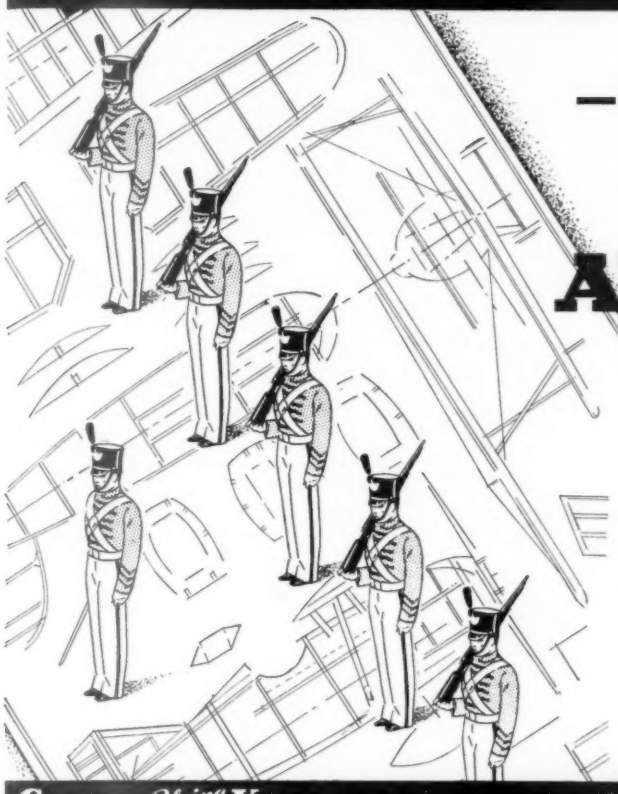


National championship ranking. Twice led the "500". Prince Nicholas drives its mate. New tires for speedway and dirt. Car perfect. Driver available.

Harry Hunt Chicago Times
Chicago, Ill.

Young America is joining the aero club that offers the best benefits. Many local "FLIGHTS."
Wings, photos, instruction, models, contests, etc. Send 10c for full details and application blank "A".
NATIONAL AERO RESERVE 114 W. 16 St., NYC

Perfect ALIGNMENT!



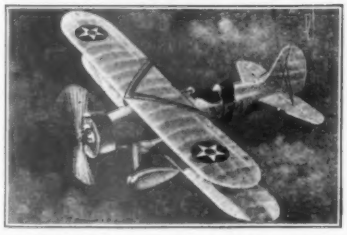
—with COMET'S Sensational New AUTO-LINE-UP

(Automatically Lines Up) Construction Method!

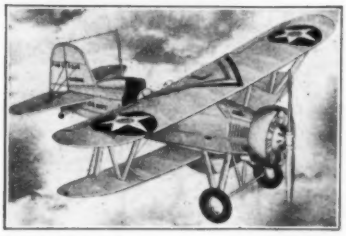
How model builders rave about "AUTO-LINE-UP!" It's a sensation—and only Comet offers it to you! Models seem to build themselves, step by step, on Comet's full-sized, perfectly designed plans. Model builders report hours of building time saved by this revolutionary construction method—and they get better flying results, too! Remember—no kit is truly modern and up-to-the-minute unless it has "AUTO-LINE-UP"—and "AUTO-LINE-UP" is exclusively a Comet achievement!

COMET Flying Model KITS ARE COMPLETE —no trick charges —no missing liquids —no skimping!

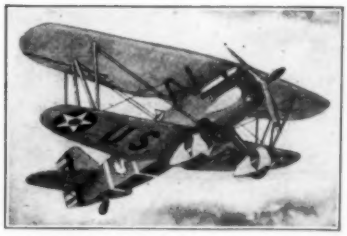
COMET



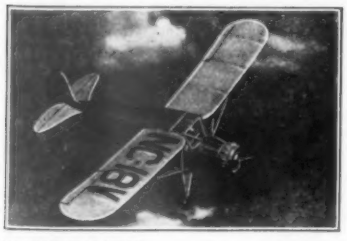
BOEING XF6B-1 (Kit No. X-6) 20½" wingspan..... $1.00



BOEING F4B-4 Wingspan 15" Kit No. 512..... 50c



CURTISS HAWK P6-E Wingspan 15½" Kit No. 513... 50c



FAIRCHILD "24" Wingspan 15" Kit No. 215..... 25c

Buy from your local Comet dealer. You'll find that he usually carries a complete stock of Comet kits and supplies—and you'll find that he is a good man to do business with! If you have no dealer in your neighborhood, and would like to become acquainted with the complete Comet line, send a 3c stamp for Comet's new catalog—which illustrates many of the newest and most popular ships—a big variety at 10c, 25c, 50c, $1.00, $1.50, $1.95 and $2.50.

Order convenient C.O.D. Way; mark, mail coupon—pay for planes, C.O.D. fee, postage on delivery! We pay postage on cash orders. REMIT cash by Money Order—If Check, add 15c extra. CANADIAN: No C.O.D., stamps nor coin. International Money Order only, plus 20c extra.

COMET MODEL AIRPLANE & SUPPLY CO.
2509 W. Cermak Rd., Dept. PA 95, Chicago, U.S.A.

( ) Send articles listed. I'll pay postman for articles, C.O.D. fee, postage on delivery.

( ) I enclose $..... for articles listed. Comet pays postage.

NAME .....

STREET .....

CITY ..... STATE .....

Poison Gas

(*Continued from page* 146)

certainly wouldn't necessitate use of 500 bombers!

From all these surmises, we can sift some elemental truth. Some of the authorities, naturally enough, are interested in painting the picture brightly because they are interested in the progress of chemical warfare and would not like to see it outlawed by a world-wide horror against its use.

Without bothering with the argument as to whether a city could be completely razed by an air attack, it should be obvious that it would at least be paralyzed. San Francisco was paralyzed in milder fashion by a general strike. With San Franciscans in the throes of panic and death, in addition to living with conditions of a general strike—traffic tied up, the law flouted, food and other necessities blocked off—they would flee the city or perish. That would be the effect of an effective gas attack.

Even if skyscrapers are gastight it is hard to see how a city could participate in a war with its residents all dwelling panic-stricken within the tall buildings. Anyway, the gastight theory doesn't seem plausible. Only this summer a great dust storm swept eastward from the drought stricken areas in the middle west of this country. Through every window, this dust swirled into the offices of New York skyscrapers. That was dust, formed of particles tremendous in size when compared with the molecules of any gas.

Already in Holland, Denmark, France and Switzerland, according to news reports, the populations are buying gas masks and are being instructed in their use. Such facts lead to a plausible picture of the next war. But will there be enough masks? And will the panicky civilians wear them correctly? And will the masks stop the most modern gases? Those are real questions.

Even if the picture is a bright one it must show a populace in masks, in skyscrapers or in specially built gastight refuges. France is so anxious in this regard and looks upon poison gas raids so realistically that she has appropriated 20 million francs with which to build such refuges for citizens in anticipation of attacks. If the picture is a dark one it must show a city in terror and death.

Eloquent in all this is the fact that discussions of air raids seldom reveal the poison gas angle. If one keeps his mind open, however, he can discern the trend. For instance, regard the mock bombing of London. The simulated air attacks were highly successful. It was clear, according to a New York Times report, that the whole of London's defensive forces were outwitted by the high-speed bombing squadron from "Southland," and this is broad daylight.

Thirty-six bombers that "destroyed" the Air Ministry Building were not even sighted by defending aircraft. Next in importance to paralyzing the Air Ministry, heart of the nation's defending force, was the raid on the Chemical Industries Building. That is significant. Twenty-one bombers were sent to destroy it. It was certainly considered, in this rehearses strategy, a vital organ of the defense. A squadron of seven, incidentally, got through to the objective and back to the south coast without brushing once with the enemy.

Then, there is the situation regarding forts and coast guard defenses. There are several reasons why the use of chemical agents against Coast Artillery should be particularly effective, and each of these reasons can be applied to situations elsewhere. Coast fortifications are for the most part fixed. If gassed they cannot be moved. If the batteries are to operate the personnel must go to their stations.

Many of the emplacements, walled on three sides and from twenty to thirty feet below the top of the parapet, make ideal pockets in which gas can collect and linger.

Again, the duties performed by Coast Defense men are not compatible with wearing of masks. They must react small scales, plot positions accurately and rapidly, track targets through telescopes. These operations must be finished speedily, else the firing data is useless.

Into this picture fly the planes, bent on destroying the forts or crippling them so that a fleet lying off shore can do the job. This will be easy for flying squadrons, released from aircraft

AU ACCREDITED

There are good positions in

AVIATION

if you get the RIGHT kind of TRAINING

Aviation is progressing rapidly and the need for trained men means that you get in on the ground floor, if you start your training at this

U. S. Government Approved University
State Accredited

Offering B.S. Degree Course in Aeronautical Engineering, Pilot's Ground, Master Mechanic and Administrative Courses, Days and Evenings. U. S. Bureau of Air Commerce approved Airplane and Engine Mechanic's School qualifies you for Government Licenses in one year.

Send for FREE BOOK "AVIATION FACTS"

You should know about opportunities in AVIATION and how you can cash in on them. This FREE book tells you the story of what an amazing industry can mean to your future progress. Write, call, or telephone Victory 2733 for your free copy. Address Dept. BC.

AERONAUTICAL UNIVERSITY
CURTISS-WRIGHT BUILDING
Dept. BC, 1338 S. Michigan Blvd. Chicago, Ill.

carriers. The Coast Artillery fortifications make ideal targets. They are large, they can be spied easily from the air and they cannot move.

The aviators would be interested immediately in blinding the anti-aircraft guns. They could drop white phosphorus bombs on the guns and machine-guns. A gas not so fatal would be titanium tetrachloride, nicknamed "F. M." Another good air weapon would be "mustard." This liquid is poisonous because of its fumes. It is also casualty producing because of the burns it gives. And it is so sluggish and stable that it would persist on for days.

All this is a sample bit of strategy. In general, planes will drop asphyxiating gases in sea engagements but the chemicals they will peddle principally will be smoke screens. At the battle-front they will do likewise. And over the cities they will repeat the procedure. That is how significant a role chemicals dropped from the clouds will play in the next war.

The rollcall of poisonous chemicals known to be available today in case of war is a long one. It would be swelled considerably if those chemicals, of which the formulae are being guarded in each national capitol, were known. In general, however, not every nasty chemical can be used. There are certain qualifications. First, of course, it must be toxic—must have prompt physiological action of undesirable nature when present in the air in very small concentrations.

Again, it must be a stable compound. It must be able to stand in bulk or in the shell for days and months without blowing up or otherwise changing in its chemical nature. It must not corrode the metal surfaces of the shell with which it comes in contact nor send off fumes that would attack other portions of the shell and eat at the gun or airplane. It must be able to withstand the temperature of the explosion, when the shell is burst open, without decomposing, exploding or otherwise changing in its chemical composition.

From the practical viewpoint, it must be made from materials which are common and inexpensive in the country. It must be made by a method that can be transferred to large-scale operations and not be merely a laboratory freak

It must not be a bad actor like hydrogen cyanide that is so deadly and uncontrollable that it turns upon those making it. In this regard, its preparation if several chemical reactions are necessary, should be so skilfully mapped out that it is not a toxic chemical until the last step in its manufacture.

Those are all qualifications as viewed by the manufacturer and transporter. There are other tests for the gas from the viewpoint of actual warfare. First of all, if possible, it should be so modern and deadly that it can penetrate known gas masks. It must be heavier than air so that it will not rise too high above the ground surface but not so heavy that it will not diffuse efficiently.

On the other side there is as much ingenuity being used in research for defending weapons against gases. There are masks for infantry, for artillery, for submarine men, for aviators, for horses, for dogs. Indeed, everybody in the next war will be masked except lice and these astute creatures will probably seek out masked sections of human bodies. There has been developed a type of chemical-impregnated cloth that is said to be mustard-proof. Armies have knowledge how to construct gas-proof structures and have organized so that prompt alarms can be given of the approach of gas clouds.

If clothing can really be made mustard-proof one great cause of fear in the next war can be erased. It is a terrible substance. It is a tear gas in smallest concentrations. In slightly larger doses — about one-thousandth ounce per one thousand cubic feet of air—it attacks the lungs. In addition, it causes horrible, non-healing burns of the skin. And it is one of the most persistent of gases. Major Cyrus B. Wood, of the U. S. Army Medical Corps, told of an incident to illustrate mustard's tenacity.

"At Edgewood Arsenal is a narrow gauge railroad along which, one day several years ago, a car with a large quantity of liquid mustard was being run. An accident occurred and this car overturned and discharged its contents at a cement culvert. The site of the accident was placarded with 'Danger' signs, and bleaching powder was spread about and worked into the soil thoroughly and repeatedly.

"This culvert drained a swamp, and in the course of time it needed cleaning. Nearly two years after the accident it was decided safe to put some laborers at this job and, on a bright warm sunny day, they went and worked there. The lunch hour came and two of them sat on the concrete culvert to eat their lunch which they had with them. The two men were admitted to the hospital that afternoon with mustard burns on their buttocks."

Any discussion of chemical warfare from the American standpoint must necessarily mention the work being done at this arsenal, located thirty miles from Baltimore and sprawling on a Chesapeake Bay peninsula. It is the home of the American Army's Chemical Warfare Service, where research is being carried on in these days of peace and where chemicals will be prepared and shells filled if war comes.

The buildings are practically empty now but if war came the place would become alive over night.

END.

SUPPLY PRICES SLASHED

War declared on cut price competition. Never before have you seen such amazingly low prices. Take advantage while it lasts. Join our club and receive FREE Wing pin and membership card which entitles you to special discount on future orders. Just mention registration number. Membership Card and Wing Pin given FREE on all orders of $1.00. Two 16" flyers free with $2.00 order. A 24" flyer free with $4.00 order.

HELL DIVER

COCKPIT CONTROL 24" FLYERS $1.00
Postage 15c Extra

A GOLD SEAL achievement. Control wires designed not to interfere with rubber motor. Kit contains horns, pulleys and hinges ready made. ¾ finished wheel pants, two colors tissue, all parts printed on balsa, aluminum spun cowl, finished propeller and simplified ABC plans, cement, dope, etc. Choose from: Curtis Swift, Spad, Douglass 038, Albatross D5A, Hell Diver, Stinson Reliant.

Balsa Wood
Our Balsa is Kiln-Dried, Grade A—cultivated South American Balsa, free from all defects. All sheets, strips, and planks are in 18" lengths. For 6" lengths, double 18" price. Add 10c extra postage total of order.

18" Sheet Balsa

1/32x2	.7 for	.10
1/16x2	.7 for	.10
3/32x2	.6 for	.10
1/8x1	.5 for	.10
1/8x3	.5 for	.10
3/16x2	.3 for	.10
1/4x2	.3 for	.11
1/8x2	.1 for	.05
1/32x3	.4 for	.10
1/16x3	.4 for	.10
3/32x3	.3 for	.10
1/8x3	.3 for	.10
3/16x3	.2 for	.10
1/4x3	.2 for	.12
1/8x2	.1 for	.10

18" Strip Balsa

1/16x1/16	50 for	.05
1/16x1/8	.25 for	.05
1/16x3/16	20 for	.05
1/16x1/4	.15 for	.05
3/32x3/32	25 for	.05
1/8x1/8	.20 for	.05
1/8x3/16	.15 for	.05
1/8x1/4	.10 for	.05
1/8x3/8	.8 for	.05
3/16x3/16	10 for	.05
3/16x1/4	.8 for	.05
3/16x3/8	.6 for	.05
1/4x1/4	.8 for	.05
1/4x3/8	.5 for	.05
1/4x1/2	.4 for	.05
1/2x1/2	.3 for	.05

18" Balsa Planks

1"x1"	...1 for	.06
1"x2"	...1 for	.10
1"x3"	...1 for	.15
1"x6"	...1 for	.25
2"x2"	...1 for	.20
2"x3"	...1 for	.25
2"x6"	...1 for	.45
3"x3"	...1 for	.40
3"x6"	...1 for	.75

Balsa Propeller Blocks

1/2x3/4x5".7 for	.05
1/2x3/4x6".7 for	.05
3/8x1x7" .3 for	.05
3/4x1x8" .2 for	.05
3/4x1 1/4"x10" ..... 1 for	.07
1x1 1/2"x15" ..... 1 for	.07

Special Balsa Blocks for Cowlings, Nose Piece, etc.

2"x2"x2" ..... 1 for	.03
1"x3"x3" ..... 1 for	.04
1"x3"x6" ..... 1 for	.06
1"x3"x3" ..... 1 for	.03
1"x2"x6" ..... 1 for	.05

How to Order In order for prompt delivery please comply with instructions.

1. Orders under 50c not accepted—due to our very low prices.
2. Add 15c for packing and postage on orders up to $1.50; orders for $1.51 and over add 10 per cent for packing and postage charges.
3. Add 10c extra to above charges on orders less than $1.50 West of the Mississippi and Canada.
4. Canadian or Foreign Stamps or Coin not accepted as payment. Canadian and Foreign make International money order payable at Brooklyn, N. Y.
5. Remit by postal or express money order.

Dealers and Clubs Write for Special Price List

Construct-A-Loid Cement
Strong! Quick drying, flexible. Try it and you'll never use anything else.

1 oz.	.07
2 oz.	.10

Clear Dope
The best grade of nitrate dope, thinned for model use.

1 oz.	.07
2 oz.	.10

Colored Dope
This is highly pigmented air-craft dope. Colors: Red, Blue, Orange, Yellow, Black, Olive-drab, Silver, White, Gray, and Green.

1 oz.	.07
2 oz.	.10

Thinner
For thinning your heavy liquids.

1 oz.	.07
2 oz.	.10

Motor Rubber
Guaranteed absolutely fresh stock.

1/16 flat ..... 20 ft. for	.05
045 square ..... 20 ft. for	.05
1/16 square ..... 17 ft. for	.05
1/8 flat ..... 17 ft. for	.05
3/16 flat ..... 12 ft. for	.05

Turned Hard Wood Wheels

	Per Pair	
1/2" diam.	.....	.02
3/4" diam.	.....	.03
1" diam.	.....	.03
1 1/4" diam.	.....	.05
1 3/4" diam.	.....	.07
2 1/2" diam.	.....	.10

Turned Balsa Wheels
Light and Strong. Bushings with every pair.

	Per Pair	
1/2" diam.	.....	.03
3/4" diam.	.....	.04
1" diam.	.....	.05
1 1/4" diam.	.....	.06
1 3/8" diam.	.....	.07
1 3/4" diam.	.....	.12
2" diam.	.....	.20

Celluloid Wheels
Bushings with every pair.

Per Pair	
3/4"	.06
1"	.08
1 3/8"	.11
1 7/8"	.16

Streamline Celluloid Wheel Pants
Small—for 3/4" or 1" Wheel per pair. .15
Large—for 1 3/8" or 1 7/8" Wheel per pair. .30

Dummy Radial Engines
Celluloid. 9 Cylinders.

1 1/8" diam.	.18
2" diam.	.25
3" diam.	.34

Sheet Celluloid

4"x5"	.05
8"x10"	.10

Tissue
AA Quality
Sheet 20 1/2x24 1/2—White ..... 3 for .05

Colored Tissue
Red, Green, Blue, Olive-drab, Orange, Yellow, Black, and Silver. Sheet 20 1/2x24 1/2 ..... 2 for .05

Wood Veneer Paper

15x20 Sheet	.10
20x30 Sheet	.15

Bushings
Useful for Wheels, propeller bushings, movable controls, exhaust pipes, etc.
Per Doz.

1/16 diam.	.03
3/32 diam.	.0

3/4" Finished Balsa Wheel Pants
Wheel Pants shaped ready for sanding for
Per Pr.

1/2" Wheels	.05
3/4" Wheels	.07
1" Wheels	.10
1 3/4" Wheels	.12
1 7/8" Wheels	.15

1" diam.	.05
1 3/8" diam.	.07
1 7/8" diam.	.12
3" diam.	.20

Washers

1/8 o. d. Brass ... per doz.	.01
1/4 o. d. Copper ... per doz.	.01

Music Wire

Straight	.014	.020	.028 .034

6 ft., any size ..... .03

Model Pins
Package of 100 ..... .05

Bamboo

1/32 sq. x 10 1/2" ... 3 doz.	.05
1/16 sq. x 12" ... 1 doz.	.03
1/16x1/4x15" ... 6 for	.05

Reed

1/16	..10 ft. .05
3/32	..8 ft. .05
1/8	...6 ft. .05

Sandpaper
5 large sheets .05

Dowels
1/16" diam. x 12" doz. .06
1/8" diam. x 18" ... 6 for .05
3/16" diam. x 18" 4 for .05
1/4" diam. x 18" ... 3 for .05

Dope Brushes
2 ..... for .05

Thrust Bearings
Small .025 Hole ... 6 for .05
Large .035 Hole ... 6 for .05

Ready Made Balsa Propellers

5"	...1 for .05
6"	...1 for .05
7"	...1 for .07
8"	...1 for .08
9"	...1 for .09
10"	...1 for .10
11"	...1 for .11
12"	...1 for .12

Aluminum Tubing

	Per Ft.	
1/16 O.D.	.010	
Wall	.....	.09
3/32 O.D.	.010	
Wall	.....	.07
1/8 O.D.	.010	
Wall	.....	.08
3/16 O.D.	.015	
Wall	.....	.10
1/4 O.D.	.035	
Wall	.....	.10

Sheet Aluminum
.005 per sq. ft. ..... .15
.010 per sq. ft. ..... .20

CONSTRUCT-A-PLANE CO.
738 Grand St., Dept. 709, Brooklyn, N. Y.

'Chutes

(*Continued from page* 170)

cords in an emergency. Again the responsibility is placed on the trained pilot.

This device permits as many as six persons to be lowered to earth by means of a large parachute attached to an automatic trap floor in one compartment of a transport ship. A series of springs throws the floor clear of the aircraft frame and the parachute would begin to unfold as soon as the floor cleared the ship. Even if passengers were not fastened in their seats when the descent started, they would have time to fasten their safety belts.

Then, there is the method of detaching the entire cabin and floating it to earth with a giant parachute attached. With this method, whether the cabin or the entire plane is lowered, would be practical with only one type of parachute—the triangular type.

With a circular 'chute, the oscillation would be just as dangerous as the crash itself, while with the triangular type there is no oscillation due to its design and it can even be steered to avoid unfavorable landing places. With the plane 'chute, the ship or cabin could be automatically disconnected upon landing so as to prevent dragging.

The cost of a parachute with an area of between 5000 and 8000 square feet of silk is naturally one that would increase the cost of the airplane at least 25 percent. Even if it were as high as 50 percent, the transport companies would still be able to eke out a living and a small profit for their stockholders.

The value of a human life cannot be figured in dollars and cents and no cost is too high to pay for any factor of safety. No matter what the cost of the device used to insure safety for man, woman or child, if it saves just one human life, it has paid for itself many times over. We may be only worth 69 cents chemically, but each of us think that millions would be nearer our real worth. Over 400 lives have been saved by the one man parachute.

One of the most interesting things to note is that many of those whose lives were saved were pilots with thousands of miles safely flown, with hundreds of hours in all types of ships, under every conceivable condition. Flyers whose ability with anything that could fly was unquestioned and whose precautions before any flight was as thorough as the preparation of a surgeon before any manual treatment on a patient.

No novices, these, inviting trouble and then failing through lack of experience. These men are among the "Caterpillars" that are living, because they had the forethought to wear a life insurance policy in the form of a Parachute—and when it became necessary to use it—didn't argue the cost.

How needful we are of protection in everything that we do. Automobiles are insured because something might happen. Accident policies are sold for the same reason. This prerequisite of sound sane reasoning may never be used—yet, when the emergency arises, how invaluable it becomes.

I'll defy anybody to read Don Glassman's book "JUMP", and not fully realize that the parachute is the "One p'ece of equipment you want."

END.

Eyes

(*Continued from page* 167)

4. Great maneuverability near ground essential to enable plane to avoid ground fire and to aid observation.

5. Protection from slipstream for observer.

6. Provision for either air-cooled or liquid-cooled engines.

7. One Browning thirty-caliber gun synchronized to fire through propeller, single or twin Lewis or Browning guns carried in rear cockpit (defensive).

8. Provision for radio set whose weight will not exceed 100 pounds, and which will have ranges of thirty miles with telephone and 150 miles with telegraph, respectively.

Corps Observation performs the important missions of photography, artillery adjustment, and observation for Corps and Division Headquarters.

The observation squadron is composed of thirty-one officers, 113 enlisted men and thirteen planes. It is divided into A, B, and C flights of four planes each, the flight being commanded by a captain with eight officers under him; and the commander's plane with two officers under him. The commanding officer of an observation squadron is a Major, the commanding officer of a flight is a Captain. Administration and technical transport claim the other five officers of the squadron.

A group is composed of one Group Headquarter's Squadron, one Service Squadron, and four tactical squadrons. One observation group is assigned to General Headquarters, one group to the headquarters of each field army, and one group to each corps. This would automatically assign one squadron to each division. Squadrons attached to inactive divisions would be used in general work for the corps.

END.

Babe Walker

(*Continued from page* 168)

sition, the science of ski jumping was revolutionized," he said. During Mrs. Walker's tests, men were constantly watching the instrument board, timing her and recording figures.

Mrs. Walker, or "Babe" as she is more familiarly known in Akron, has been parachute jumping for several years and makes a weekly exhibition jump at Akron's municipal airport. She recently became a member of the Caterpillar club, one of the few girls to join that famous organization, for having saved her life when a parachute fouled, by pulling another chute just before reaching the ground.

Extreme thirst and a few black and blue spots on knees and elbows were the only after-effects of the test on the young parachutist. "The thirst is explainable because all of the moisture has been driven from your body by the extreme wind," explained Dr. Klemperer

END.

HAYFEVER

ASTHMA and SUMMER COLDS are unnecessary. Complete relief only $1.00 Postpaid. Nothing else to buy. Over 40,000 HOLFORD'S WONDER INHALERS sold last year alone. Mail $1.00 today for full season's relief to THE DANDEE CO., 252 HENNEPIN AVENUE, MINNEAPOLIS, MINNESOTA, or write for Free Booklet.

ULTRA-MODERN

THE STRATOSPHERE

You don't know model airplane performance until you've seen the powerful, streamline Stratosphere in action. Calm air take-off run twelve inches, an amazing climb and the flatest glide you've ever seen.

Span 36" Length 28" Weight 1½ oz.

COMPLETE KIT Postpaid.....$2.25

BUNCH MODEL AIRPLANE CO.

"Models that really fly"

2303 S. Hoover St. Los Angeles, Calif.

A company owned and operated by Licensed Transport Pilots and Aeronautical Engineers.

MAILING LISTS

rave the way to more sales with actual names and addresses of Live prospects.

Get them from the original compilers of basic list information—up to date—accurate—guaranteed.

Tell us about your business. We'll help you find the prospects. No obligation for consultation service.

FREE

60 page Reference Book and Mailing LIST CATALOG

Gives counts and prices on 8,000 lines of business. Shows you how to get special lists by territories and line of business. Auto lists of all kinds.

Shows you how to use the mails to sell your products and services. Write today.

R. L. POLK & CO.

Detroit, Mich.

Branches in Principal Cities

World's Largest City Directory Publishers Mailing List Compilers. Business Statistics. Producers of Direct Mail Advertising.

WORLD WAR RELICS

FOR CLUB HOUSE OR DEN

Vickers Aircraft Machine Guns—cost the Govt. about $700 each—rendered unserviceable without marring; just released by War Dept. Weigh about 33 lbs. Send M. O. Check or Draft for $7.75 (F.O.B. N. Y.) or on receipt of $1.00 will ship C.O.D. by express.

FIALA OUTFITS, Inc., 47 Warren St., New York

News Photos

(*Continued from page* 162)

shutter clicking partner, George A. Tash. Together, they formed the Metropolitan News Photos Company and tacked their shingle on the second floor of one of the first hangars built at the Chicago Airport.

For many years these two men have been recognized as Chicago's unofficial greeters and have met, photographed and even dined with such celebrities and notables as: Mary Pickford, Cary Grant, Wallace Beery, Mrs. Franklin D. Roosevelt, Prince and Princess Bernadotte of Sweden, Rudy Vallee and Jack Benny.

In the early hours of the morning, or late at night, these two boys may be found in front of the administration building, combing the hair of some petit movie star, or perhaps, even fanning the well known Sally Rand. Mr. Tash tells me that he is one of Sally's fans but he didn't say which one. Both boys have been staying up nights, meeting every passenger plane from the West Coast. They've been expecting Mae West for the past two months, and they're anxious to see which one of the pair she will hand the invitation.

In spite of the fact that they meet every big-named air-passenger on his, or her arrival at Chicago's Municipal Airport, these two men have much other work to do. You can be sure that when they are not telling some big-shot to watch the birdie, they are out photographing some important event, such as the recent Chicago Stockyards fire.

Many times in the past, Mr. Rotunna and his partner have risked their necks in an attempt to secure good clear pictures of fires, floods and the like so that you could get a better idea of the tragedy as you read your evening paper. Pictures, as a rule, are much more convincing than words. The large newspaper and news bureaus realize this and as a result these men are usually paged for good interesting shots.

Just to prove that these two men know what the public wants in the way of news pictures, let me tell you what happened during the Stock-yards fire which if you will remember, was Chicago's big news event for the Summer of 1934.

The fire was first reported at 4:03 P. M. At 4:18 P. M. the two cameramen were circling low over the burning buildings and cattle-pens. They took several pictures which, incidently, were the first to be published in any paper. Not satisfied with the altitude between their plane and the fire, they motioned the pilot to fly lower. The pilot, flying an open plane, refused their request because of the intense heat and down drafts.

Undaunted by this pilot's refusal, they returned to the airport, reloaded their cameras and took off in a cabin-plane for a second flight over the now large fire area. This time they circled lower and still lower until it seemed that the ship would tear itself apart from the violent action of the different upcomers.

Smoke poured through the open door which had been removed before taking off. Choking and with tears streaming from his eyes, Mr. Tash stood at the open door, held tightly by his partner "Mike". Just as the plane lurched violently upward, he snapped his camera and both men fell to the floor of the cabin. They wanted to try again but the pilot flatly refused and no man had a better right to do so. He had fought those controls for twenty long minutes.

The result of that one shutter click is printed herewith and you will have to admit that, in spite of the odd angle, the picture shows real action and good detail.

In taking these pictures the pair established a newspaper record for speed, endurance and action. And this is just the sort of record the papers like.

In case any of you readers of POPULAR AVIATION happen to get out to Chicago's Municipal airport, drop in on the boys. You will find their office full of interesting action shots and they'll be only to glad to show them to you.

END.

DIAMOND SUPPLIES for DEALERS

BEST QUALITY · LOWEST PRICES · SUPPLIES · KITS · ACCESSORIES

If 18" lengths are desired, take ⅛ of 36" length price.
If 3" widths are desired, double price of 2" widths sheet Balsa.
Thinner same price as clear dope.

BALSA STRIPS
36" Lengths

	Per 100
1/32x1/16	12c
1/16x1/16	14c
1/16x⅛	20c
1/16x3/16	25c
1/16x¼	27c
3/32x3/32	25c
⅛x⅛	30c
⅛x3/16	50c
⅛x¼	55c
⅛x⅜	65c
3/16x3/16	50c
3/16x¼	60c
¼x¼	85c
¼x⅜	$1.25
¼x½	1.60
⅜x⅜	1.90
½x½	2.25

BALSA SHEETS
36" Lengths

1/64x2, 10 for	14c
1/32x2, 10 for	15c
1/16x2, 10 for	18c
3/32x2, 10 for	21c
¼x2, 10 for	23c
3/16x2, 10 for	32c
¼x2, 10 for	42c
½x2, 10 for	75c

BALSA PLANKS
36" Lengths

1x1, each	6c
1x1½, each	8c
1x2, each	15c
1x3, each	20c
1x6, each	35c
1½x1½, each	25c
2x2, each	25c
2x3, each	35c
2x4, each	45c
2x6, each	60c
3x6, each	$1.25

STANDARD PITCH BALSA PROPELLER BLOCKS
Per Dozen

⅝x½x5	5c
½x¾x5	5c
½x¾x6	6c
⅝x1x7	14c
¾x1x8	18c
⅞x1x9	25c
¾x1¼x10	30c
¾x1¼x12	35c
1x1½x12	40c
1x1½x15	55c

BAMBOO

1/16 sq. x 14, 1 gross for	20c
1/16x¼x11, 1 doz. for	5c

REED

1/32 or 1/16 dia., 50 ft. for	18c
3/32 or ⅛ dia., 50 ft. for	20c

DOWELS

1/16 dia., x 12" per doz., 100 for	55c, 25 for 20c
⅛" dia. x 36" per doz., 100 for $1.50, 25 for	45c
3/16 dia. x 36" per doz., 100 for $2.25, 25 for	75c

COLORLESS CEMENT

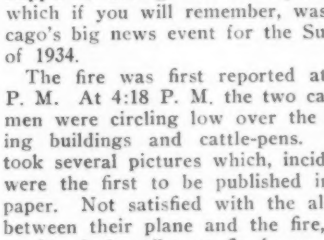
1-oz. bottles, per ½ doz.	25c
2-oz. bottles, per ½ doz.	45c
4-oz. bottles, per ½ doz.	75c
1 pt., each	4 c
1 qt., each	75c
1 gallon, each	$2.00
1 qt., each	65c
1 gallon, each	$1.75

SHEET CELLULOID
(Transparent)

12½x16, each	19c
6x8, doz.	65c

CLEAR DOPE OR BANANA OIL

1-oz. bots., per ½ doz.	23c
2-oz. bots., per ½ doz.	40c
4-oz. bots., per ½ doz.	70c
1 pt., each	40c



5 Inch Solid Kits $4.10 gross

5" solid model Kits, complete with all parts printed, full-size plan, insignia sheet, cement, and sandpaper sell very nicely at any price up to 10c. Choice of Boeing P-12F, Texaco Sky Chief, Spad, Fokker D-VII, Lockheed Vega or S.E.5. 50c per doz., $4.10 gross.

2 In 1 Kit-15" Flying Scale Models

of Fokker D-VII and Curtiss Robin in one box with large quantities of materials, complete with carved prop, wire parts bent, full-size plan and instructions, printed sheet, large bottles of cement and dope. Boys, order these kits again and again. **3 for $1 - 12 for $3.60**

HOW TO ORDER No orders for under $2.50. All orders shipped express, charges collect. No C. O. D. orders.

Free goods included to make up charges

FREE WITH EVERY $5 ORDER 1 DOZ. INSIGNIA SHEETS
Complete catalog with all orders

DIAMOND MODEL SUPPLY CO.
915 Saratoga Ave., Bklyn. N.Y.
Dept. 409

YOU GET LOWEST PRICES HERE!

We have expanded 100% and guarantee 48 hour service

See Special FREE Offer Described Below

COLORED DOPE
White, yellow, orange, blue, red, green, olive drab, black, silver, gold or grey.

1-oz. bottles, per ½ doz.	30c
2-oz. bottles, per ½ doz.	55c
4-oz. bottles, ½ doz.	$1.00
1 pt., each	.50c
1 qt., each	85c
1 gallon, each	$2.25

HIGH-GLOSS
To shine up colored models.

1-oz. bottles, per ½ doz.	30c
2-oz. bottles, per ½ doz.	55c
4-oz. bottles, ½ doz.	$1.00

WOOD VENEER
(For scale model work)
20"x30", 3 sheets for 25c

JAPANESE TISSUE
White, per doz. 12c
Colored, asst., per doz. 15c
All colors.

FRESH PARA RUBBER
AA GRADE

1/32 sq., 225' skeins	25c
.015 sq., 225' skeins	35c
3/32 flat, 225' skeins	35c
⅛ flat, 225' skeins	40c
3/16 flat, 225' skeins	70c
Per pound, any size	$1.25

INSIGNIA SHEET
12 pr. & rudder and tail markings with gummed back. Per doz., 36c; 100 for $1.75

WIRE, STRAIGHT LENGTHS
Nos. 5, 6, 7, 8, 9, 10, 11, 12, 14, 15 or 16, 100 ft., ass't sizes 25c

THRUST BEARINGS
Small or large, each 2c
Per doz., 18c; per gross 75c

MODEL PINS
Per doz. pkgs. 35c

SANDPAPER
Per doz. pkgs. 25c

WASHERS
⅛ or ¼ dia., 1 gross 10c

3" DIA. CELLULOID MOTOR AND DRAG RING COMBINED
(First time on market)
Special price, 3 for $1.00

DUMMY RADIAL ENGINES
(Celluloid, 9 cylinders)

1½" dia., ½ doz. for	80c
2" dia., 3 for	65c
3" dia., 3 for	85c

CELLULOID WHEELS

⅜" dia., pr., per doz.	24c
1" dia., pr., per doz.	25c
1⅜" dia., pr., per doz.	35c
1⅞" dia., pr., per doz.	60c

BALSA BALLOON WHEELS
(Machine turned)

½" dia., per doz.	9c
¾" dia., per doz.	11c
1" dia., per doz.	14c
1⅜" dia., per doz.	19c
1⅞" dia., per doz.	38c
3" dia., per doz.	85c

SHEET ALUMINUM

.002 thick, 5 ft. for	35c
.005 thick, 5 ft. for	50c
.010 thick, 5 ft. for	75c

ALUMINUM LEAF
.0003 of an inch thick, 3½" wide, 100 ft. for 35c

ALUMINUM TUBING
(Special 1/100" wall)

1/16 O.D., 5 ft.	30c
3/32 O.D., 5 ft.	32c
⅛ O.D., 5 ft.	32c
3/16 O.D., 5 ft.	40c
¼ O.D., 5 ft.	45c

ACCESSORIES
Aluminum Cowls
Anti-drag rings, closed N.A.C.A. or open N.A.C.A.

1½", 3 for	25c
2", 3 for	35c
2½", 3 for	43c
3", 3 for	53c

Die-cast Bombs

¾" long, 3 for	10c
1⅛" long, 3 for	20c
3" long, 3 for	37c

2-bladed Props (Die Cast)

1½" long, 3 for	20c
2½" long, 3 for	35c

3-bladed Props (Die Cast)

1½" long, 3 for	25c
2½" long, 3 for	35c

Pursuit or Swivel Machine Guns (Die Cast)

⅝" long, 3 for	10c
1" long, 3 for	15c
1¾" long, 3 for	25c

Die-cast Wing and Tail Lights, 3 Pcs. to a Set

For 12" model, 3 sets	20c
For 15" model, 3 sets	40c
For 20" model, 3 sets	60c

Carved Props

5", 3 for	9c
6", 3 for	11c
7", 3 for	14c
8", 3 for	17c
10", 3 for	20c
12", 3 for	25c

Advertise in this Directory. # BUYER'S DIRECTORY Rates: $5.00 per inch.

AIRPLANES FOR SALE

FOR SALE

Unlicensed OX5 Fairchild Challenger 3 place. 7 hrs. on motor since new; New prop; Scintillia; Millerized: Duals; Never in weather always hangared; Cover perfect; Lights; Two color paint rubbed finish; 250 hrs. Total on ship, $500.00. Also one Millerized OX5 Perfect shape $65.00. Set Piston New $5.00. Carb New $4.00.

Roy A. Good, Box 1227, Sweetwater, Texas

PROPELLERS

PROPELLERS OF DISTINCTION—These laminated propellers are the most efficient made, regardless of name, make, or price. Order from this ad, cash with order.

4' for Harley and Indian motors	$ 3.50
4' 6" Heath-Henderson, metal tipped	7.65
6' Fords, Lawrence, Anzani, metal tipped	9.98
8' for OX-5, hardwood, copper tipped	16.98
MOTORS: 40 H.P. motors, rebuilt like new	49.98
SHIPS: Famous 98 Trainer, flyaway	148.00
TIRES: 7.00-4 Air Wheels, including hubs.. Information, incl. leather-bound flying manual	16.00 .25

UNIVERSAL AIRCRAFT CO., Dept. I, Ft. Worth, Tex.

BOOKS

AERO BLUE BOOK

1935 Revised Edition Now Ready

Gives specifications of over 390 different airplanes ranging from 20 to 7000 h.p. and nearly 100 aero engines. Only information of its kind ever compiled. Priceless to students, engineers, dealers, and flyers. FREE! If you order now, your choice of "How to Choose a Flying School" or "Points on Buying a Used Airplane." Send now!

AIRCRAFT DISTRIBUTING CO., Box 3-PA, 1480 Arcade Bldg., St. Louis, Missouri. $1.00 Postpaid

Get your start in the fast-growing

COMMERCIAL AVIATION INDUSTRY

New ocean routes soon starting. America's fastest-growing industry. Our booklet, "Wings of Commerce," lists over one hundred different occupations in this field, salaries paid, apprenticeships, promotions, how to qualify and apply. Lists all airline companies in U. S., Canada, Mexico, Central and South America. Information is complete. Price 20c postpaid.

CONTINENTAL SALES CO.
Box 344, Dept. II Indianapolis, Ind.

Aviation Books

Complete Stock of Books on All Aviation Subjects.

Send for Catalog.

GOODHEART-WILLCOX
2009 So. Michigan Ave., P.A. 9, Chicago, Ill.

LIGHTPLANE DESIGN

1935 Edition—Approved by Experts
— MONEY BACK GUARANTEE —
Write for FREE LITERATURE
By W. H. Korff, Aeronautical Engineer
C. A. STELLE, Publisher MT. VERNON, ILL.

INSTRUCTION

FREE ARMY FLYING TRAINING

Air Corps Cadets get 300 hours solo flying, with salary, expenses paid. Information pamphlet, how to apply, 20c. Same information on Navy Aviation training, 20c. Information on Marine Corps Aviation, 20c. All three for 40c. Pamphlets prepared by Air Corps Veteran. USED AIRPLANES, GLIDERS $40 up. Literature 10c.

CONTINENTAL SALES CO.
Box 344, Dept. II Indianapolis, Ind.

AERONAUTICAL FRATERNITY

AVIATION APPRENTICES

AIR-MINDED Young Men interested in entering the field of Aviation as Apprentices. Write immediately, enclosing stamp, to MECHANIX-UNIVERSAL AVIATION SERVICE

P. O. Box 33 Detroit, Mich.

MODEL AIRPLANE SUPPLIES

HURLEMAN ARISTOCRAT

MODEL AIRPLANE MOTOR
⅞" Bore, 1" Stroke, 4500 r.p.m.
PRICE $17.50
Light weight Coils—Plugs
Send 3c Stamp for Folder
Mfg. Solely by
WALTER HURLEMAN, INC.
1428 W. Bristol St., Phila., Pa.

INTERNATIONAL AIRCRAFT MARKINGS

Naval, Military, War-Time Insignias Painted on Wing Fabric. Size 15"x15".

3 MARKINGS FOR $1.00 (NO STAMP)

STATE THE NATIONS DESIRED
SOUTHWEST SUPPLY
110 Woodworth Ct., Los Angeles, Cal.

PATENTS

PATENT YOUR IDEAS

Send me a sketch or simple model of your invention. SATISFACTORY TERMS. *DO IT NOW!*

FREE Illustrated Literature Confidential Advice

Z. H. POLACHEK
1234 Broadway, N.Y.

Z. H. POLACHEK 1234 BROADWAY PATENTS NEW YORK REG. PATENT ATTORNEY

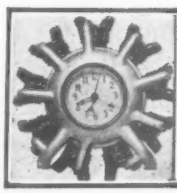
PATENTS

PERSONAL SERVICE

Let me act as your personal confidential representative in Washington on all your patent problems. Delays of even a few days in protecting your ideas, or the slightest carelessness in handling your patent papers, may easily be very costly. My personal service assures speedy action and strictest confidence. Send immediately for my free 72-page booklet, "How to Get You Patent."

L. F. Randolph, 372-D Victor Bldg., Washington, D. C.

MISCELLANEOUS



MODERN CLOCK

For Friends of Aviation

You'll want an electric clock since you can have one of these. No winding. No setting. Always the correct time. Made of unbreakable metal, height 6". Electric movement. Only 100-135 Volts, A.C.....$3.95 With wind-movement..$3.95

BAUDIS ARTCRAFT
349 E. 92nd St., N. Y. C., N.Y.

NEW!! ALL WAVE POCKET RADIO

Fits in any pocket easily. Weighs only 4 ozs. as shown! NO tubes, batteries or electrical connection needed! Nothing to wear out or need replacement—only one moving part. Separates and receives ALL stations with beautiful clear tone by simply hooking to any metal object as desks, beds, telephones, etc. Range up to 100 miles—much greater under good conditions—very little static! Can be used by ANY-ONE ANYWHERE! Foolproof—NOT a cheap CRYSTAL outfit! Absolutely *complete* with midget phone and directions to use on Bicycles, Autos, in offices, hotels, camps, at home, etc. No messy hook-ups! THESE ARE FACTS! Send only $1.00 and pay postman $1.99 plus postage or send $2.99 (Cash, Money order or Check). Ideal gift. Guaranteed. Order NOW! (Foreign orders 65 cents extra). At Better Dealers. **Tinytone Radio Co. Dept. P.A. Kearney, Neb.** $2.99 complete

BUILD A FRONT DRIVE

The details for building a real front wheel drive, for racing or sport use are now available to you. With blueprints on this car which is built without the extensive machine work found in cars of this type, using your 4 cyl. motor and other car parts it can be built most economically.

(Send Stamps for Details)

Edward A. Borntraeger
3450 N. Marshfield Ave., Chicago, Ill.

R L T

INITIALS ENGRAVED FREE

"Wear One--Give One to a Friend" FRIENDSHIP BRACELET

Sturdy, Aviator's Model. Specially designed. Beautifully engraved. Made of finest quality polished chromium. **Guaranteed 5 years.** Your own or friend's or Club's initials. Advertising price 50c postpaid. **Order today.**

Only 50¢

Wrap coin or send M. O. Send paper strip for measurement.
QUALITY PRODUCTS CO., B-214 Art Bldg., Galveston, Tex.

BABY RADIO

Wt. only 1½ lbs. **Real LOUD-SPEAKER** built in. Size only 3½ x5½x2½" (note picture). Easily carried in any large pocket. Triple hi-gain tube. Built in aerial, speaker, hi-efficiency rectifier. **SHORT WAVE** to 175 meters—also **broadcast** band to 550 meters —NO PLUG IN COILS. Ideal personal radio. Absolutely complete. Kit of parts and diagram for **$6.50.** COMPLETELY WIRED AND TESTED FOR ONLY **$6.98.** Send only $3.00 (M. O., currency or check) and pay postman $3.98 plus postage or send full amount and we pay postage. Guaranteed to operate.

$6.98 Postpaid Completely wired and tested.

TINYTONE RADIO CO., Kearney, Nebraska

Genuine PYROIL

Air aces recommend Pyroil's great safety factor. Shields all frictional areas with a glossy, slippery surface which becomes virtually a part of the metal. Makes the metal SELF-LUBRICATING in emergencies. Write for facts. Mfr'd. and Guart'd. by Pyroil Co., W. V. Kidder, Pres., 748 LaFollette Ave., LaCrosse, Wis., U. S. A.

Examine This List of BOOKS

AERIAL PHOTOGRAPHY

		PRICE
Photographic Pictorialism	F. C. Tilney	$5.00
Airplane Photography	Herbert E. Ives	4.00
Applied Aerial Photography	Capt. A. C. McKinley	5.00

AIRPLANE TECHNOLOGY

Airship Design	Burgess	7.50
Flight Without Formula	Comm. Duchene	3.50
The Mechanics of Aeroplane	Comm. Duchene	3.50
Force of the Wind	H. Chatley	2.00

BALLOONS AND AIRSHIPS

Rigid Airship	E. H. Lewitt	7.00
Historic Airships	R. S. Holland	4.00
Aerostatics	Edward P. Warner	4.00
Free and Captive Balloons	C. DeF. Chandler	6.00

ELEMENTARY

Aviation From the Ground Up	Manly	2.69
The Aeroplane Speaks	H. Barber	3.50
Air, Men and Wings	George-Gilman	3.50
A.B.C. of Aviation	Victor Page	1.00

AVIATION ENGINES

Automobile and Aircraft Engines	Arthur W. Judge	7.00
Airplane Engines	Lionel S. Marks	3.00
Engine Dynamics and Crankshafts	Glenn D. Angle	4.00
Airplane Engine Encyclopedia	Glenn D. Angle	6.00
Aircraft and Automobile Material	Arthur W. Judge	6.00

FAMOUS FLYERS AND FLIGHTS

Heroes of the Air	Chelsea Fraser	2.50
The Flight of the Southern Cross	Kingsford Smith-Ulm	2.50
Knights of the Air	L. J. Maitland	3.50
India by Air	Sir Samuel Hoare	2.50
The Tragedy of the Italia	David Gindici	3.00
Life and Exploits of Comm. Byrd	C. J. V. Murphy	2.50
The First World Flight	Lowell Thomas	5.00
The Couriers of the Clouds	Edward Shenton	2.50
Flying with Lindbergh	Donald Keyhoe	2.50

FICTION

The Air Menace and the Answer	Elvira K. Fradkin	3.00
Airmen or Noahs	M. F. Sucator	6.00
Air Travel	J. E. Mooney	2.00
Conquest of the Air	C. L. M. Brown	1.00
Land, Sea and Air	Mark Kerr	6.00
Opportunity Ahead	Ernst-White	1.50

METEOROLOGY—NAVIGATION

The Fourcade Stereogoniometer	Capt. Richard Duncan	3.50

TRANSPORT—COMMERCIAL AVIATION

Opportunities in Aviation	Walter Hinton	3.00
Airports and Airways	Donald Duke	4.00
International Airports	S. S. Hanks	5.00
This Aviation Business	E. W. Diehman	3.50
Transport Aviation	Chandler-Black	3.00
International Control of Aviation	Kenneth Colegrove	2.50

WARFARE

The Beginnings of Organized Air Power	J. M. Spaight	6.00
Air Service, A.E.F.	H. A. Toulman	5.00
Air Power and War Rights	J. M. Spaight	7.50

YEAR BOOKS—ANNUALS—GENERAL

Aircraft Year Books 1929	Aero. Ch'm. Commerce	5.25
Aviation Law	H. G. Hotchkiss	6.00
Legal and Medicine (Aviation Medicine)	L. H. Bauer	6.00

POPULAR AVIATION
608 S. Dearborn St. Chicago, Ill.

Classified

FOR SALE: Factory Overhauled Wright 7-cylinder model R760-D engine. Karl Ort, 599 W. Poplar St., York, Pa.

USED AIRPLANES $50.00 AND UP. Literature 10c. Continental Sales, Box 344, Dept. 11, Indianapolis, Ind.

COLLECT COINS. Send for free price list.—M. Gazso, 6114 Merkle Ave., Parma, Ohio.

BUILD your own Midget Racer or Lightplane, in spare time, from Storms Plans. Engines, air propellers, wheels, sprockets, chains, hubs, countershafts, axles and other items at low prices. Circulars 10c.—Storms Aviation Co., 13 Southside Ave., Asheville, N. C.

HEATH Aeroplane for sale, very reasonable, with or without motor.—August Grader, 7015 East End Ave., Chicago, Ill.

UNIVERSAL FLIGHT CALCULATOR. Dead reckoning, drift angle, time-speed-distance, interception, altitude correction, miles conversion and course plotting. $1.00, prepaid. Florida Instr't Co., Box 26, Sta. A, St. Petersburg, Florida.

PROPELLERS: OX-5, $13.00; CONTINENTAL $8.50; AERONCA, SZEKELY, $6.50; HEATH, $3.90; FORD, $7.00. LITERATURE, 4 PENNIES. WATSON, BOX 247, JACKSONVILLE, FLORIDA.

HAVE you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute, Dept. 21, Barrister Building, Washington, D. C.

BUILD yourself a racy midwing monoplane for less than $100.00 complete with air wheels. Twelve blue prints, designed by a practical engineer, a $10.00 value only $4.98. 40 H.P. motors, $49.98. Propellers, $2.98 up. Send 25c for more information on our sensational prices. Hibbs, Ft. Worth, Texas.

BALSA Stamping Press with set of adjustable dies for stamping and printing Balsa. Price $2.00. Seakay, Box 23, Station G, Bklyn, N. Y.

PHOTOGRAPHS—Aviators, Planes, Celebrities, Scenic. All sizes. Sample and price list, 10c.—Ralston Photos, 612 No. Denny, Indianapolis, Ind.

HUNDREDS OF AIRPLANES, $40 up. Motors, parachutes, crackups. Directory 20c postpaid with descriptions, owner's price, name and address. Used Aircraft Directory, Athens, Ohio.

SELLING OUT: EAGLET Tail $25.00; Landing Gear $9.00; Glider Ribs and Fittings $6.00; Szekely Propeller $12.00; Indian Converted and Hub $14.00; Aeronca motor parts. Lists 3c; Aero Shop, Box 164, Pottstown, Pennsylvania.

GREAT LAKES TRAINER FOR AMUSEMENT AND PILOT TRAINER. OPERATED BY 10 HORSEPOWER ELECTRIC MOTOR. $1800 MACHINE FOR BEST OFFER. LYNCH, 6242 So. Whipple St., Chicago.

POPULAR AVIATION

covers all branches of aviation in a simple, non-technical style. Therefore, P.A. is of direct interest to everyone engaged in the industry or to those who have taken up aviation only as a hobby—

SEND IN YOUR SUBSCRIPTION NOW.

POPULAR AVIATION

608 S. Dearborn St. Chicago, Ill.

Barter and Exchange

This department is for exchanges and swaps only. For money transactions use the Classified Section. Rates for Barter and Exchange notices, 3 cents per word.

AIRPLANES

TRADE. Power glider—wing 34x5.—Joseph Wallace, 130 Valley Rd., Montclair, N. J.

PARKS P-1. Millerized Ox5. 35 hours on motor since installed two months ago. Relicensed till May, 1936. Copper wings. Black fuselage. Covering excellent. Compass airspeed, duals. Spare Ox5. Pictures on request. $550.00 takes all or will trade for motorcycle and cash.—R. L. Jarvis, Jr., c/o Riverside Chevrolet Co., 1308 Washington Ave., Cairo, Ill.

FOR SALE OR EXCHANGE—Buhl Bull Pup—in flying condition. Can be licensed.—Harry E. Myers, R. D. No. 1, Thomasville, Pa.

WHAT IS OFFERED for a 2 place Elias Monoplane less kinner motor. Best offer takes it.—Nick Bella, 8 Talot Lane, Portchester, Conn.

TRADE. Millerized Ox5, want motorcycle; cash or what have you.—Arnold Sielaff, Alden, Iowa.

LICENSED OX-5 Eaglerock, trade for car or $350. Transport pilot will teach purchaser to fly it, gasoline and oil furnished. Board thrown in. Beat this offer if you can. Terms: part down, and balance when you can fly ship.—Terry Noll, Box 132, Bellefonte, Pa

OX-5 LAIRD—trade for car or $130 cash or installment payments. Teach purchaser to fly for $35 additional.—John Yilman, Pleasant Gap, Pa.

PARTNER WANTED: For part ownership in plane. Write for details.—P. Provenzano, 3123 N. Major Ave., Chicago, Ill.

FOR SALE OR TRADE—Racing type Church Mid-wing, new, complete; less motor $75.00.—Nick Esser, 6641 Alabama Ave., St. Louis, Mo.

TRADE OR SELL—Little used Indian Twin converted, $35. Model T conversions developing 40 H.P. at 2000 R.P.M. in the air, $30 and up. Both with choice of low or high pitch propellers. Also Harlequin under construction, other conversions, high lift camshafts, magnetos, other lightplane supplies.—Hal E. Crawford, 2309 W. Kiowa, Colorado Springs, Colo.

MOTORS, ENGINES, ETC.

WANTED—Twin outboard motor, have complete Indian 4 cylinder motor.—Fredrick Costa, 508 E. County Rd., Hanford, Calif.

CONVERTED FORD T MOTOR and stand for light plane or boat. Very good condition. Used on boat one season. Sell $18 or trade.—Geary Hein, 341 Cattell Ave., W. Collingswood, N. J.

WANTED—Good Ox 5 motor complete with prop. and mag. Must be in good condition. Have shotgun, air rifles, moving picture equipment and small A.C. motors.—Irwin Weaver, 1309 Arkansas Ave., Dormont, Pgh., Pa

WANTED—Motorcycle motor, twin or four. Have Elgin wrist watch, 22 target pistol and cash.—J. Steiner, 845 N. Keeler Ave., Chicago, Ill.

HAVE Johnson outboard motor 16 in good condition and high power rifle, Savage 250-3000. Want Harley, Davison or Indian motorcycle.—Frank Bielicki, 17 Peach St., Lackawanna, N. Y.

WANTED STEEL TUBING. All sizes. Will trade air wheels, motors, cash. Send us a list of the aeronautical supplies you wish to dispose of.—Universal Aircraft Co., Fort Worth, Texas.

WILL TRADE OR SELL 60 H.P. Anzani, 6 cylinder motor—worth $50.00. I need airplane dope, fabric, electric motors, electric drills, table saw, jointer or a good Ox5 fuselage. What have you? Also have parts for late Anzani 80 H.P. motor.—Frank Van Duzer, 1017 Porter St., Waukegan, Ill.

MISCELLANEOUS, ETC.

FOR SALE OR TRADE—Heath Parts—Henderson converted motor, prop., tail, alerons, wings, one slightly damaged. Will trade for outboard motor, 2 cylinder, or $25.00.—Peter Gotchel, 1839 S. 6th St., Camden, N. J.

WANTED—Motorcycle in running condition. Will trade correspondence course by the Aviation Institute of U. S. A.—Harry Arnold, North East, Pa., R. F. D. No. 4.

YOUNG MAN, 25, with home-study Aviation training, desires work at repair depot, airport or factory in exchange for mechanics training, room and board.—Aelred Te Bockhorst, R. 1, Washington, Iowa.

"COSMOPHON" high-fidelity pick-up. Home "Talkie Unit" will fit any projector and is attached to radio. Cost new $49.00. "Vitascope" camera, moving 16 m.m. 50' hand cranked. "Keystone" projector Model No. E-42 with motor. 16 m.m. Will trade for anything I can use. Would like wing for Heath 1929 Model V, with struts, or other aviation parts.—Francis McKinnon, 200 North Perry St., Hagerstown, Ind.

"PROSPECTIVE FLYING STUDENTS"—What you have been waiting for: Flying Instructions—Dual $5.90 per hour; first ten hours solo $4.90 per hour; all other solo time $3.90 per hour. Free Ground Course. Board and Room $7.50 per week. Licensed Ships, Transport Pilots. Instruction will be given on two open biplanes and one cabin monoplane. We have no put-puts or so-called light planes. Automobiles, motorcycles, or what have you, taken in as payment on flying time. Chance to work to defray part of your expenses to a limited number. Operators at the same field for thirteen years.—New Way Flying System, Bellefonte, Pa.

AVIATION COURSE plus cash, for typewriter, rifle, printing press.—Clair Rozelle, Delphos, Ohio.

FOR SALE OR TRADE—Complete popular $65.00 course in the Theory and Principles of Aeronautics. $15.00. Cash or some good tools. Micrometers, gauges, etc.—A. E. Stanek, 5136 Belair Rd., Baltimore, Md.

WILL do any repair work or make special partz, especially engine parts in exchange for cash or trade. All work guaranteed.—Wilson Ramsey, 1320 Scott Ave., Cambridge, Ohio.

YOUNG MAN—Twenty, white, single, willing to work as pilot for one year in exchange for commercial flight and ground training, will also repay cost of training, after being located in industry. Free to travel anywhere.—Louis J. Fitzsimmons, 3134 Burgundy St., New Orleans, La.

YOUNG LADY—Experienced bookkeeper-stenographer, desires position in aviation industry; or will work in return for flying course.—E. Krause Schoharie, N. Y.

Planes Wanted

LIGHTPLANES

WANTED. Great Lakes sport trainer in good condition and moderately priced. Have a Buhl Pup in A1 shape to trade or will pay cash.—CHIN NON, 209 West Main St., Lewiston, Mont.

WANTED. American Eaglet, cracked but repairable. Must be priced right. Might consider a similar plane or an OX job.—LOYAL NEILL, Crane, Mo.

GIPSY-MOTH, AVION, AERONCA OR HEATH WANTED. Need not be licensed but must be in perfect shape and reasonably priced. Must be sold on time payment plan, so much per week or per month. Preferably, this ship should be located within a radius of 250 miles from New Orleans, La., although other location would also be considered. Send complete details and price, also photo, in first letter.—LUCKY CHARLES MO, 506 Copernicus Ave., Gretna, La.

WANTED. Any type of plane selling for $150.00 or less.—Carl Brigance, Oronogo, Mo.

WANTED. Heath, T. M. Scout, Jenny, or Standard. I also want 18x3 wheels. I will trade a car for the ship.—JOSEPH SCHULTZ, Bernuille, Pa.

WANTED. A light two or 3-place airplane in good condition. Must be licensed and preferably located in Kansas or vicinity. Give full particulars.—HOWARD STURN, Bushton, Kans.

TRAINERS AND SPORTPLANES

WANTED. OX5 Waco 10, fuselage in first-class shape less covering. Also a Curtiss Robin 3-place fuselage in first-class shape less covering. Will answer all letters.—LIEUT. WAYNE C. BRUBAKER, National Aero Reserve Corps, Terre Hill, Pa.

WANTED. Good 3-place biplane in good condition, licensed or eligible for a license. Will consider an OX-5 or XX-6, but had rather have a better motor. Will pay part cash and the balance monthly.—J. E. FRANKLIN, 1401 14th St., So. Birmingham, Ala.

WANTED. A two or 3-place plane in good condition, a 2-place preferred but will consider an OX5 if priced right. State lowest price in first letter.—JOHN W. HERRON, New Cumberland, W. Va. Box 56, R. F. D.—2.

WANTED. A cracked Eaglet, Mono-Prep or similar plane. Send full information on condition and price.—IRWIN KRATNER, R. F. D.—2, Beaver Dam, Wisc.

XUM

Insignia of 31st Bombardment Squadron

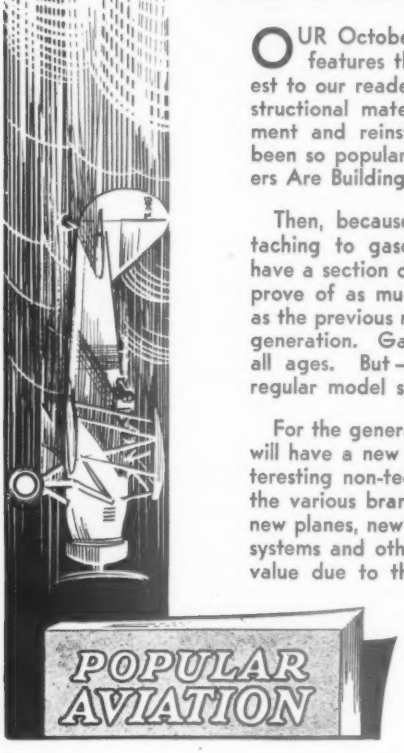
Don't Miss the October Issue

20 ARMY SQUADRON INSIGNIA *In Full Color!*

OUR October issue marks a number of new features that will be of the greatest interest to our readers. We will introduce new constructional material into the lightplane department and reinstate the department which has been so popular in the past—"What Our Readers Are Building".

Then, because of the great interest now attaching to gasoline propelled models, we will have a section devoted to this subject which will prove of as much interest to our older readers as the previous models have been to the younger generation. Gasoline model building appeals to all ages. But — this does not mean that the regular model section will be discontinued.

For the general reader, POPULAR AVIATION will have a new appeal because of the many interesting non-technical discussions bearing upon the various branches of the art. Description of new planes, new instruments, new communication systems and others will have a new interest and value due to the improved presentation.



Subscribe Now Is the Time

Pan-American

(*Continued from page* 156)

it was first decided that a trans-Pacific route would be put into operation, the Pan American engineers got busy with research and engineering studies, detailing the specifications for greatly advanced marine aircraft.

The reception accorded these specifications when they were first submitted to the aeronautical industry were very discouraging. However, after detailed study, both the Sikorsky Aircraft Corporation and the Glenn L. Martin Company contracted to build the flying boats to meet the severe specifications, backed by performance bonds to insure that they were capable of meeting the specifications and providing the performance demanded.

As is perhaps well known to the aviation public, two different models of the same basic type were developed by the respective designers. Sikorsky completed the S-42, trans-ocean flying boat early in 1934. This remarkable airliner with four engines producing some 2800 h.p., weighing 19 tons, providing luxurious accomodations for 32 passengers, and carrying a crew of four and a ton of mail and cargo, represented a phenomenal development.

With its wing spread of 114 feet nearly 69 feet long and standing 24 feet from keel to wing top, this ship was the largest to ever be developed in America. During routine acceptance tests it recovered for the United States the ten world records for seaplane transport efficiency, all of which were held up to this time in Europe. On its inaugural flight to Brazil, the craft was christened the "Brazilian Clipper" then flown on to Argentina.

In the fall of 1934, the great craft was placed in regular service on the east coast run through the West Indies to Rio de Janerio. The first sister ship of this S-42, the "Pan American Clipper," as it was named, has become the first trans-ocean training plane upon which marine personnel are being schooled for the trans-Pacific operations toward the establishment of the service from California to China. The third S-42 will alternate with the "Brazilian Clipper" on the run to Rio de Janiero.

In December 1934 the second trans-ocean type ship, that built by Glenn Martin, emerged from the plant at Baltimore after two years of closely guarded construction. This aerial giant is nearly a third again as large as the "Brazilian Clipper" type. It weighs 51,000 pounds, has a wing spread of 130 feet and is powered with four engines developing a total of nearly 3,000 h.p.

On the regular Pan American routes, the Martin model, now simply known as "Number 7" will be able to carry 50 passengers in addition to the crew. On a trans-Pacific run to the Orient, it will carry 24 passengers and a cargo of mail and baggage and express over the hop of 2,400 miles from Alameda, California to Honolulu, Hawaii.

Pan American now has in the course of construction eight trans-ocean type Clipper Ships and these are the only aircraft in the world known to be able to operate on schedule with passengers, mail, and express over either of the oceans.

Other advanced flying equipment owned and operated by the company includes, the Douglas "Dolphin," a bi-motored amphibian which is used along the coast of China, from Shanghai to Canton, connecting there with the regular passenger and mail service up the Yangtze River to Chengtu and from Shanghai to Hangkow and Peiping. On the associated routes of Aerovais Centrales, 200 m.p.h. Lockheed "Electras" were placed in service, materially reducing the transport time between California and western and central Mexico and providing a direct connection at Mexico City with the routes to the West Indies and to Central America.

This same type and make of ship has also been placed in service by the Pan American controlled Nacional Cubana de Aviacion lines on the island of Cuba, as well as on the routes of Pan American's Pacific Alaskan Airways. Using these planes the actual flying time required to span Alaska will be cut to seven hours.

In addition to these planes, a fleet of the world famous D.C. type Douglas high-speed airliners were delivered to the operating terminals of the Western Division of the Pan American system at Brownsville, Texas, and to the Pan American-Grace Airways at Lima, Peru and they will greatly reduce the time on the international routes to Mexico and Central America, as well as down the west coast of South America.

During its eight years of operation, Pan American has built up a most impressive record—airliners from six to fifty passengers, from three and a half to twenty-five and a half tons, from 80 m.p.h. to 192 m.p.h.—and by these steps America has progressed to the world leadership in commercial air transportation. By 1934 Pan American has assembled some 32,552 miles of airlines and had flown far enough to give *every* person in the United States a one mile ride. During last year, its fleet of 139 planes flew the bulk of the annual $7,000,000 worth of American foreign airmail, in addition to having flown 108,000 persons.

Many domestic airlines' operators complain of the fact that Pan American receives $2-per-mile carrying rate while they get but an average of 27.6 cents. But these same domestic operators get *free* government weather and beacon service, while Pan American has to supply its own, and as can be easily understood, the placing and maintaining of 99 radio-weather stations on high Andean mountain tops and lonely Argentine pampas was a very expensive business. In all, the concern has to employ nearly as many men as all the other American airlines together in order to keep everything functioning properly.

The story of the Pan American Airways is a story of success—a success brought about by old-fashioned hard work and intelligent cooperation of all parties concerned. And success in a large measure is due perhaps more to Juan Trippe than to any other person or factor, for he has preached and prayed with his men to cooperate for the good of the system.

He told them that they were not off for a lark in flying machines, but instead, they were "operating elements in an industry of transportation." He showed them, among other things that they must keep on schedule—and they *do* 99.7 per cent of the time.

END.

AVIATION BOOKS
and
Bound Volumes of P. A.

WE are headquarters for all books on all subjects pertaining to aviation, flying, construction, etc. Read up on aviation during your summer vacation. You will find this both an interesting and profitable way to spend your idle time.

We also have a number of bound volumes of POPULAR AVIATION on hand which we will dispose of at a reasonable price.

POPULAR AVIATION
608 S. Dearborn St., Chicago, Ill.

World's Best Known Aviation School

LINCOLN Training Qualifies You for a Successful Career in AVIATION

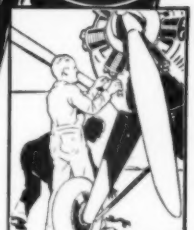
Because IT'S COMPLETE - - -
Because IT'S THOROUGH - - -
Because IT'S UNDER GOV'T. SUPERVISION

And it is the kind of training aviation executives demand in the pilots and mechanics they hire for the big pay jobs in aviation. ALL OF LINCOLN'S modern resources are devoted exclusively to perfecting your aeronautical education in the branch of aviation you choose . . . to properly prepare you for your career of romance and success.

Train at This GOVERNMENT APPROVED SCHOOL

● **We Train You for Government License as TRANSPORT, LIMITED COMMERCIAL, PRIVATE or AMATEUR PILOT**

You learn to fly various types of planes—high and low wing monoplanes, bi-planes, cabin planes and others which assure you complete experience. You learn straight flying, night flying, blind flying by instrument, acrobatics, cross country flying—everything to meet government requirements and then some. Highest type Government Licensed instructors.



● **Practical Training for Master Airplane and Engine Mechanic**—Not just theory but actual experience rebuilding many types of aircraft engines, including Wasps, Cyclones, Whirlwinds, Diesel Aircraft and other makes; also rebuilding modern airplanes under factory standards. Training also includes aerial radio, welding, instrument repair, machine shop practice—everything to equip you for the good pay jobs offered by the big airline companies and factories.

LINCOLN - TRAINED MEN MAKE AVIATION HISTORY—Numbered among LINCOLN'S graduates are men who have made the most outstanding contributions to the aviation industry. Lincoln-trained men are now employed by many of the best known companies in the industry with which we are constantly in touch with the view of recommending graduates who are thoroughly qualified.

25 years success as a mechanics' trade school and 15 years successfully teaching aviation gives Lincoln first place in experience among all civilian schools teaching aviation.

NOW IS *the Time to Start*

The aviation industry is alive and growing in tremendous strides. New developments, expansions and the U. S. Government's great aviation program are creating thousands of new jobs. Take advantage of LINCOLN'S famous training for a successful career that pays real dividends quicker! Mail the coupon now for full information.

LINCOLN AIRPLANE & FLYING SCHOOL
231F Aircraft Bldg., Lincoln, Nebr.

LINCOLN AIRPLANE & FLYING SCHOOL
231F Aircraft Bldg., Lincoln, Nebr.
Please mail me complete information about Lincoln, the World's Best Known Aviation School, and the Big Pay Opportunities of Aviation.

Name .....
Address .....
City .....
State ..... Age.....

BUFFALO PUBLIC LIBRARY, DEPARTMENT OF TECHNOLOGY